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Electrical World

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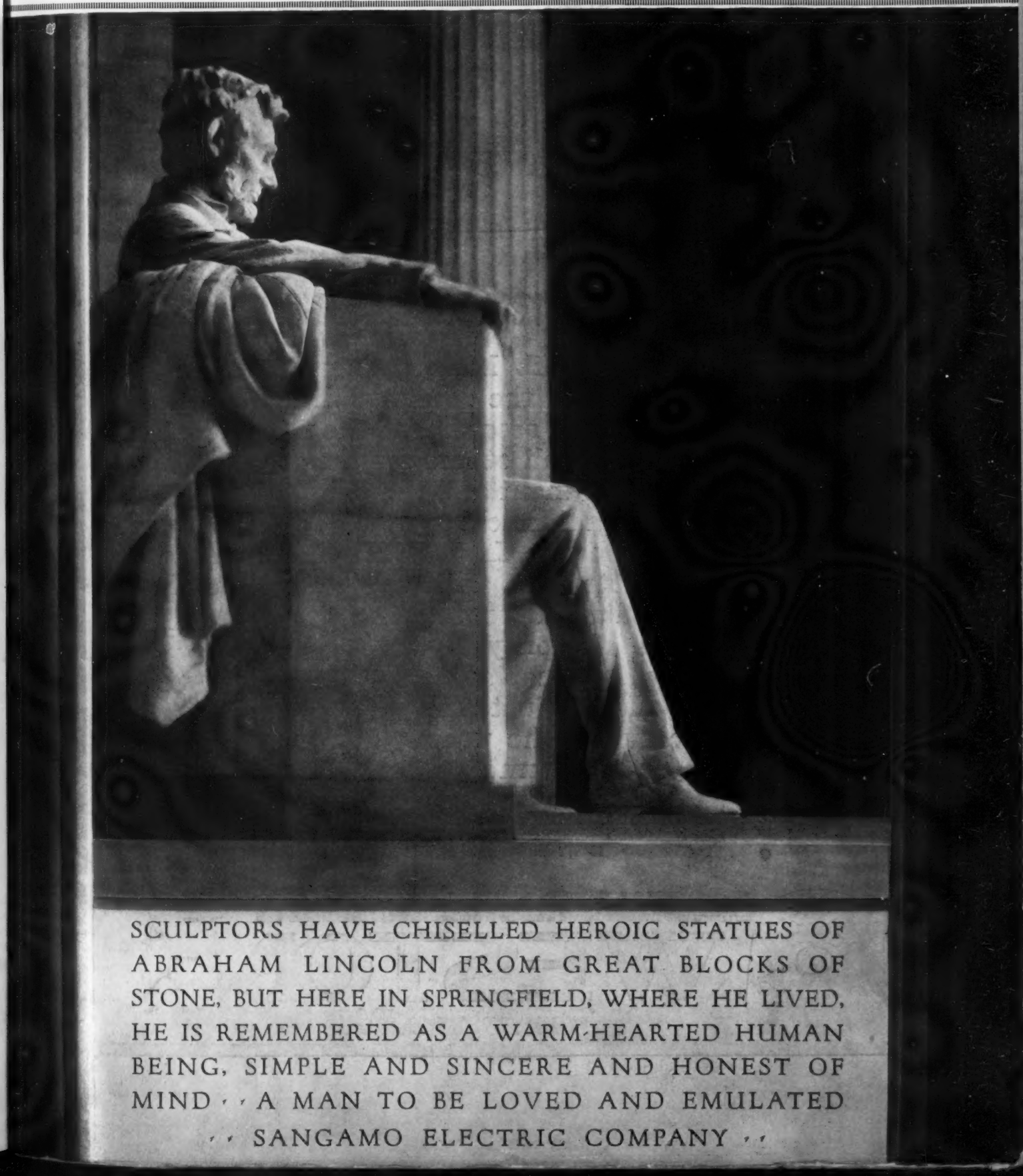
SCULPTORS HAVE CHISELLED HEROIC STATUES OF ABRAHAM LINCOLN FROM GREAT BLOCKS OF STONE, BUT HERE IN SPRINGFIELD, WHERE HE LIVED, HE IS REMEMBERED AS A WARM-HEARTED HUMAN BEING, SIMPLE AND SINCERE AND HONEST OF MIND · · A MAN TO BE LOVED AND EMULATED
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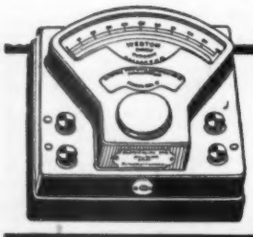

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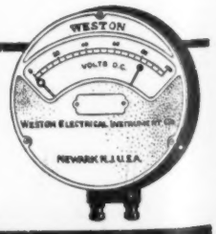

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Electrical World

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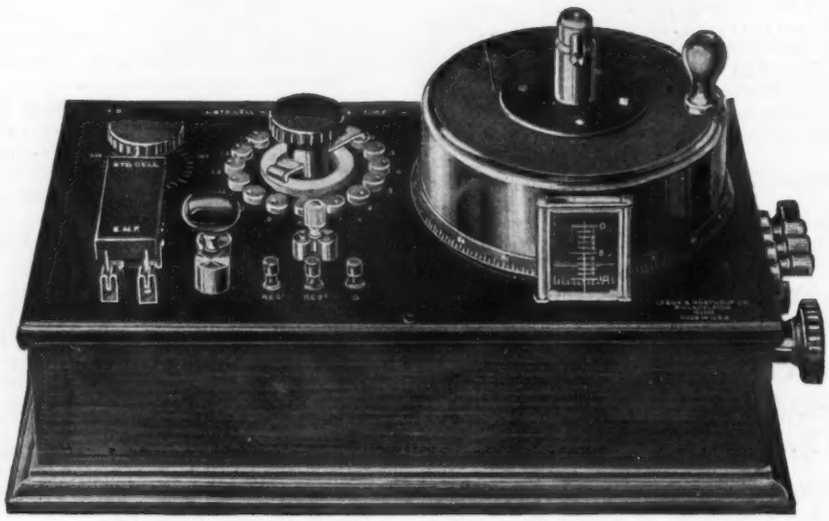

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Electrical World

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W. H. ONKEN, JR.
Editor

VOLUME 89 — *New York, Saturday, February 12, 1927* — NUMBER 7

Commissioners Excellent Interpreters of Public Utility Performance

TWO new generating stations—one on the Atlantic Coast and the other on the Pacific Coast—were dedicated with appropriate ceremony within the past two weeks. It goes without saying that the Hudson Avenue steam station of the Brooklyn Edison Company and the Balch hydro-electric station of the San Joaquin Light & Power Company embody in their design the best engineering practice of the day, making for greater efficiency in the production of electricity. At both ceremonies the heads of the respective state public service commissions were in attendance and made addresses stressing the significance of the occasion and the social aspects of modern power production. It is entirely fitting that they should have done this; for while it is incumbent upon the utilities in the exercise of their monopolistic functions to try for greater and greater economy and quite natural for them to glory in deeds well done, it is rather for the commissions to interpret the performance, to bear tribute to the excellence of the service rendered and to commend the zeal and enterprise shown. This is a duty which the commissions owe to themselves, to the utilities and to the public. It is expedient that the commissions and the public should know what strides the utilities are making and for what purpose the money raised by them is being used; otherwise they may be accused, as they frequently are, of nursing a monopoly and abusing their privileges.

Good public relations are predicated on proper understanding, and proper understanding is best assured by honest information. However highly the public may regard the utility company that serves it, it is but natural for laymen to accept more readily commission interpretation of public utility performance. It is well, therefore, for utilities to encourage the commissions to inform themselves, and for the commissions in turn to pass on to the public such factual data as are of public interest.

The Increase of Lighting Schools

EVOLVED by certain manufacturers several years ago, the idea of establishing schools of lighting has proved to be a good one. The originators of the plan are still conducting their schools, with increasing attendance each year; but the most notable aspect of this activity is the way their example has been followed. Lighting schools in increasing number are held in various cities, in co-operation with electrical leagues and central-station companies and even as a purely co-operative affair bound up with the electrical interests of the community.

Lighting schools are peculiarly necessary because of the mixture of salesmanship and technical knowledge called for in the sale of illumination. Until recently it could not be said that the principles of salesmanship were well applied in the sale of light, and electrical salesmen knew very little of the principles of proper lighting. Furthermore, the possibilities of lighting sales were not definitely revealed until adequate surveys had been conducted and analyzed by men who know the requirements in equipment and wiring for good lighting. Much of this knowledge is now available.

The experience gained in the manufacturers' lighting schools has been valuable, and it has now been combined with that of sales departments. As a consequence, very satisfactory results are being obtained in the schools. Almost every week an activity of this sort is under way somewhere. It is just another evidence of the tremendous commercial potentiality of good lighting and of the increasing recognition of its possibilities.

The Society for Electrical Development Situation

THROUGHOUT the industry there is keen interest right now in the Society for Electrical Development situation. William L. Goodwin, who has been in charge for eight years, has resigned. F. M. Feiker, also formerly an operating vice-president, had previously resigned. After fourteen years of operation, the S.E.D. stands on trial with a record that combines with a number of vital contributions to the co-operative development of the electrical industry an unfortunate history of deferred hopes. Undoubtedly "the society" has been the fountain of much dissension and controversy within the industry as well as its principal source of co-operative inspiration. And so this issue is up—shall the society go forward amply refinanced and under new management that will have the confidence of all branches of the industry or shall it cease to operate?

Give the matter careful thought and there can be but one answer—the same that led to the establishment of this organization in 1913 and its maintenance ever since. The electrical industry is a complicated structure. We have manufacturers, jobbers, contractor-dealers and power companies. Each forms a class—with a class consciousness, class interests and a class association. These groups are all organized around their own interests and are jealous of their own prerogatives. As far as their group problems and interests are concerned, their own associations are able to handle the situation nicely.

It happens, however, that these four groups of class-conscious electrical men are all citizens of the same industrial community, bound round with common interests and purposes and involved in diverse interrelationships. They are at times in need of a common meeting place where the four branches of the electrical industry can undertake definite objectives co-operatively. For

example, the industry wants to see the local leagues developed in number and in usefulness. The need for adequate wiring and the rewiring of obsolete installations concerns all groups. The dissemination of "do it electrically" publicity and the promotion of broad national campaigns are helpful to all electrical men. Such work should be done co-operatively. How? No one group association could ask for responsibility and authority to direct the work and spend the industry's co-operative funds. The other groups would not agree. The industry must have a separate institution to carry on the work of co-operative electrical development—under either the present or another name.

The Society for Electrical Development's weakness has been its lack of tie-in with the group associations. It should be so reorganized that upon its "board" will sit the presidents of the national associations of the power companies, manufacturers, jobbers and contractor-dealers, and the managing directors of these four associations should form an advisory council to guide the management.

Edison Among the Octogenarians

WHEN, "by reason of strength," a man attains four score his neighbors sit up and take notice. When a great man reaches that age all the world is interested. It is not an every-day event, for if the great do not always emulate the good by dying young, they seldom become very old. The superactivity of their minds wears them out, and on the tombs of most of them, however strong their original vitality, might be written a tribute to the

> Fiery soul which, working out its way,
> Fretted the pigmy body to decay
> And o'erinformed the tenement of clay.

Fortunately, there are exceptions, and among them is Thomas A. Edison, who, with an inheritance of longevity, has thrived upon hard work and ceaseless cerebration. Yesterday he joined company with the octogenarians, and, though the last in their ranks, he at once stands out the greatest.

According to the "World Almanac's" list, and counting those born in 1847 as eighty, Edison has in the matter of years seventy-six superiors or coevals in the hall of living fame. But a glance at the compilation shows that half of these do not really belong among the great, their inclusion being arbitrary or based on the slenderest of titles. Among the other half are some outstanding names. Depew and Root and Holmes and Gary and Baker, for instance, are justly distinguished Americans; but do their reputations echo in any other continent? Hardy and Brandes the writers, Monet the artist, Geikie the geologist, are esteemed in cultured circles, but does the man in the street recognize their eminence? Loubet of France, Weyler of Spain, Giolitti of Italy, Apponyi of Hungary, may bulk large in the records of their native countries, but they are nationalists only. Clémenceau and Hindenburg (who treads on Edison's heels) achieved a world-wide reputation in the war—Frenchmen and Germans conjured with the name of one and spat bitter hatred on the other; but already their deeds have receded, and when the definitive history of the conflict comes to be written who can say what exiguous and subsidiary rôles the erratic Muse may assign them?

In truth, only one other name of eighty years' standing ranks with Edison's as a household word in all quarters of the earth—the name of another American, John D. Rockefeller. Rockefeller's name—we mean no disrespect—stands as the symbol of two things, great riches and monopoly. Edison's is the symbol of advancing civilization and beneficent social revolution. His is the fame that "envy dares not hate." He has happily lived to see his own apotheosis in a world which, more than any other man, he has made over on its material side, lightening humanity's burdens, lessening its anxieties, adding to its innocent pleasures, and thus surely making easier its moral regeneration.

Equipotential Points in Transmission Systems

DURING the building stage of transmission systems rough checks of reasonableness are volts per mile. But as a system grows into a network the major problems deal with transfers of energy between two points on the system and with control of voltage at many points, and the yardstick is kilowatts per mile.

Such a system can use an equipotential type of analysis to good advantage for certain purposes. Energy flows more freely from high potential to low potential on a network and is more readily controlled. Studies from generating stations outward to locate points of 2, 5, 7 or 10 per cent voltage drop for different line loads are useful in these problems. Contour maps of the system under different load conditions with equipotential lines through the equipotential points are valuable in fixing substation locations, regulator locations and transformer locations. They are also useful in determining where to build new lines in the network, in fixing upon locations from or to which power can be transmitted most easily, and in giving indications of changes in system conditions that may require corresponding changes to improve the voltage regulation. Above all, a study of system potentials makes for better service to customers by calling attention to any bad voltage points that may exist.

Radio Complaints Impose an Unjust Burden Upon Power Companies

SEVERAL years ago power companies were severely criticised for failure to take steps to eliminate radio interference caused by their lines and equipment. That time has passed, and now nearly every central station in the country is co-operating fully in investigating complaints and clearing trouble. In fact, the electric service utilities have responded so wholeheartedly that they are now being made the "goat" and are spending an amount of money all out of proportion to the amount of trouble traceable to their equipment.

One large utility that has kept costs finds it spent an average of $4.47 per complaint in investigating 320 complaints during the past few months. In only 159 cases was the trouble found to be due to faulty lines or equipment of the company, and these cases cost the company an additional sum of $9.50 each to correct. Records of other power companies indicate that less than 50 per cent of the cases of interference are traceable

to their equipment, yet they have been investigating practically 100 per cent of all complaints.

In San Francisco a plan is being tried out which relieves the power companies of this unjust burden of expense. The Pacific Radio Trades Association has employed an expert who does nothing but investigate complaints. His expenses are borne jointly by the trades body and the power companies, and the utilities are called upon to investigate only those cases of trouble definitely traced to their equipment. So far the plan has worked out very satisfactorily, and as evidence of the fact that the power companies were being unjustly penalized in the matter of expense before the plan went into effect it was found during the first month that of twenty-two complaints made to the radio trades body, only two cases of radio interference were traced to the power companies' lines. There is no reason why a similar or modified plan could not be worked out in any other city or section of the country.

Plan Interconnections, but Avoid Contract Limitations

INTERCONNECTION in many areas is merely a move in the transition from present transmission systems to the network system of the future. As lines from different properties are extended and approach other lines extended from adjacent properties interconnection becomes a logical means of realizing certain financial and operating advantages. Looking at existing system interconnections, it takes no great stretch of the imagination to visualize an eventual network of power lines covering almost the entire country. Below a high-voltage grid network will be one or more networks of lower voltage, and to these networks at many locations will be connected the generating resources of the utilities interconnected. It might be said that the distribution system network of a large city is a miniature of the national power system of the future.

From this analysis it is obvious that the operating and contractual relationships involved in present interconnections should be submitted to the careful scrutiny of utility engineers. These engineers should also study economical and logical principles by the application of which present developments will merge with least trouble into the system that will satisfy future service requirements. The present period is transitional and should conform to the future development. The knowledge necessary to do this work is possessed by the engineers.

Interconnection between properties under different owners is at this time too rigidly circumscribed by contracts. The ideal should be to operate and to build two or more systems on the basis of a single ownership. This requires that authority for daily operations be vested in one man. It requires a planning committee of executives and engineers to see that extensions, operating schedules and building programs conform to the master plan which shows the ultimate development of interconnections into networks. These two principles should be applied to present-day interconnection practice. The best interconnection contract is one that embodies these ideas and in addition an arrangement for adjusting the commercial aspects of energy transfers and very little else.

Rigid details of operation and exact specifications of load and of transfers of energy and complicated rate clauses in interconnection contracts simply make inflexible an arrangement which depends upon flexibility for success. Interconnections and utility systems are growing very fast and a static contract is a handicap and not a help. The time is ripe for sound engineering work to arm utility executives with facts and principles which will help them build on a better basis.

What Is a Customer?

AN ELECTRIC service company customer ought to be, statistically, a much more definite quantity than, let us say, the customer of a retail store. He is certainly more definite than the store cash customers, who can be counted only in terms of number of sales. The electrical customer is, so to speak, geographically fixed, for he is at the end of a wire, he has a meter usually, and he has an account.

But let us assume that Mr. Smith uses electric light and appliances in his home; convinced of the advantages of electric heat, he installs a range and water heater—on a separate meter, of course; he owns a plant that is run by motor drive and that consumes energy also for commercial lighting. Now, is there one Mr. Smith or are there quadruplets? Mr. Smith or four Messrs. Smith?

The question is not a fanciful one. It arises with every attempt to collect customer statistics. It has caused perplexity and calls for solution. The answer hinges, not on some ideal definition, but on two simple and practical considerations: How are the figures to be used, and what data can be obtained most uniformly, reliably and with minimum effort?

Statistics are of negligible significance as absolute quantities. Their importance lies in the relations which they show. For the central-station executive the number of consumers furnishes several standards of comparison. Ratio of domestic customers to population, monthly or annual kilowatt-hours per customer and rates of increase are of obvious importance. They provide yardsticks for achievement and for estimating potential growth. To the electrical manufacturer customer data afford information as to market possibilities and constitute a basis for sales quotas. Plainly it is immaterial, from these points of view, whether Mr. Smith's shop is run under his own name or whether he becomes the Excelsior Corporation.

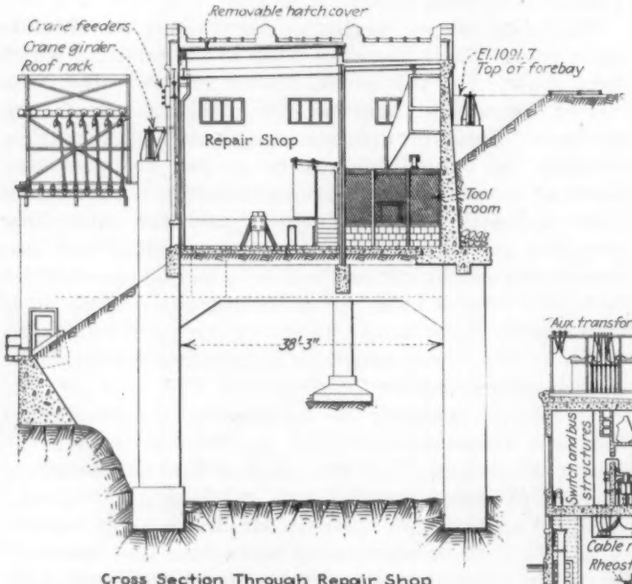
He should certainly be included in the number of domestic consumers and just as certainly among the power consumers. If it were desired to count the actual number of separate individuals purchasing energy and to avoid counting Mr. Smith four times, every account would have to be scrutinized name by name, unless it were the company's practice to render combined bills, even where service was given at different localities. The task would be out of all proportion to the results.

What, then, is a customer? How shall the number be determined? Probably the easiest way is through the record of meters. Until something better can be adopted, we suggest that it be taken as the number of "live" meters plus the number of non-meter contracts, *e.g.*, flat-rate. Where these items are not readily available, any method giving substantially equivalent results should be used. The main point is to have uniformity and to use a national method in harmony with each companies' own statistics.

Eliminates Idle Superstructure

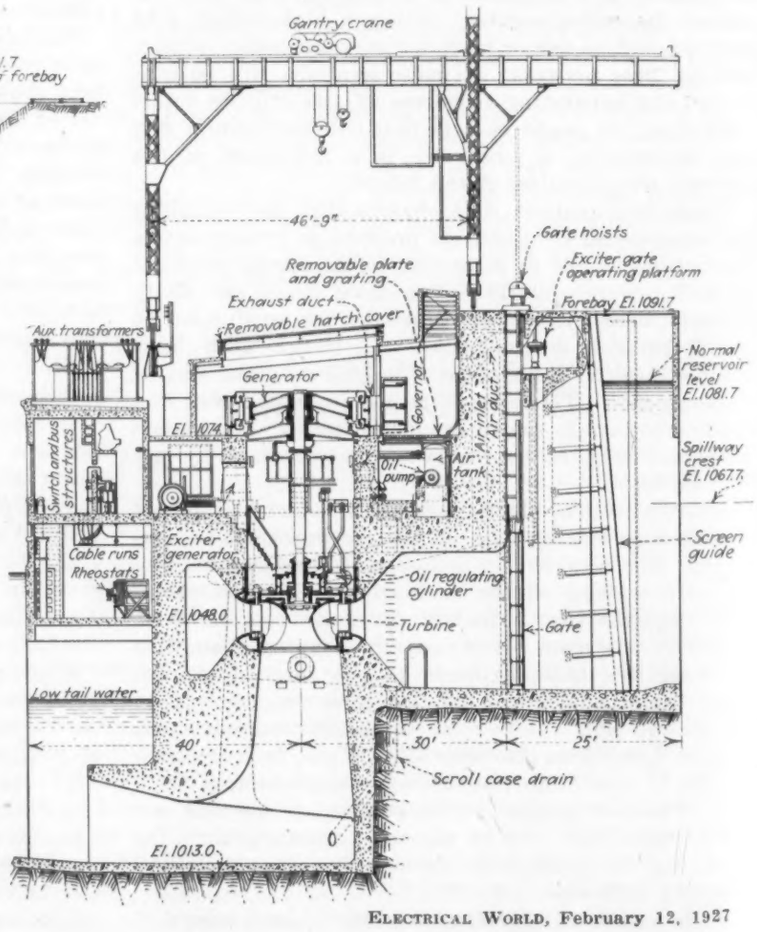
NEARLY every power-house turbine room is built with considerable clearance over the tops of the generators to permit handling the largest piece of equipment with the overhead cranes. This practice makes the appearance of the turbine room more impressive and probably assures a more comfortable working temperature in the summer. However, there is evidence here and there that some engineers question the necessity of building a superstructure large enough to permit handling all equipment indoors, at least in hydro-electric plants. One example of the contrary practice is in Idaho at the Cove plant on the Bear River, another at Mitchell Dam on the Coosa River, Alabama, and a third at Blanchard, Minn., on the Mississippi River. The last-named plant, which is illustrated here, is that of the Minnesota Power & Light Company, Duluth, of which L. M. Pharis is chief engineer and H. J. Underhill general superintendent.

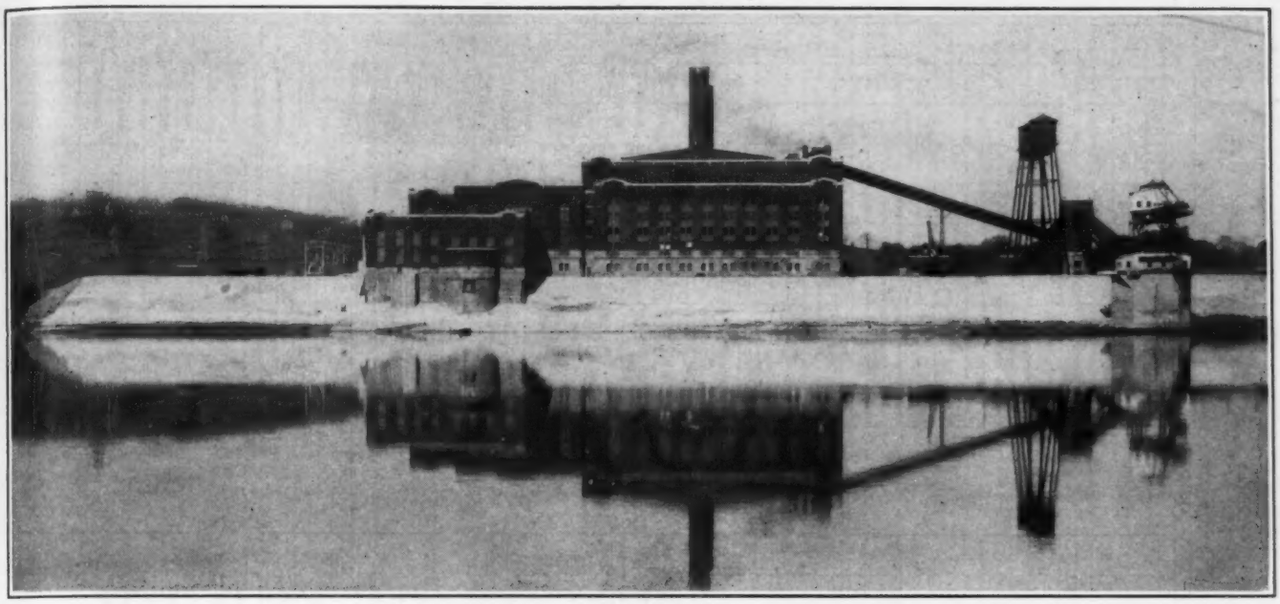
It may be noted that the station roof clears the generator tops by only a small margin and really consists of removable hatch covers through which equipment may be handled by an outdoor gantry crane.



Cross Section Through Repair Shop

To avoid the necessity of ever making outdoor repairs a repair shop is provided into which equipment can be moved by the gantry crane. Of course, the cost of the gantry crane and the repair shop must be balanced against the cost of a superstructure and indoor crane in determining the economy of this construction over the same plant with a superstructure. The engineers who built this plant point out that the economy of this construction increases with the length of the station—a three-unit station possibly being the smallest which would warrant this departure.





COLUMBIA STATION FROM THE OHIO RIVER

12,495 B.t.u. Per Net Kilowatt-Hour

Obtained During Twelfth Month of Operation at Columbia Station, Which Employs Powdered Coal, 600-Lb. Steam Pressure, Tandem Turbines, Steam Reheat and Three-Stage Bleeding—Effects of Tuning-Up Periods Presented

By C. W. DE FOREST
Vice-President Columbia Power Company, Cincinnati, Ohio

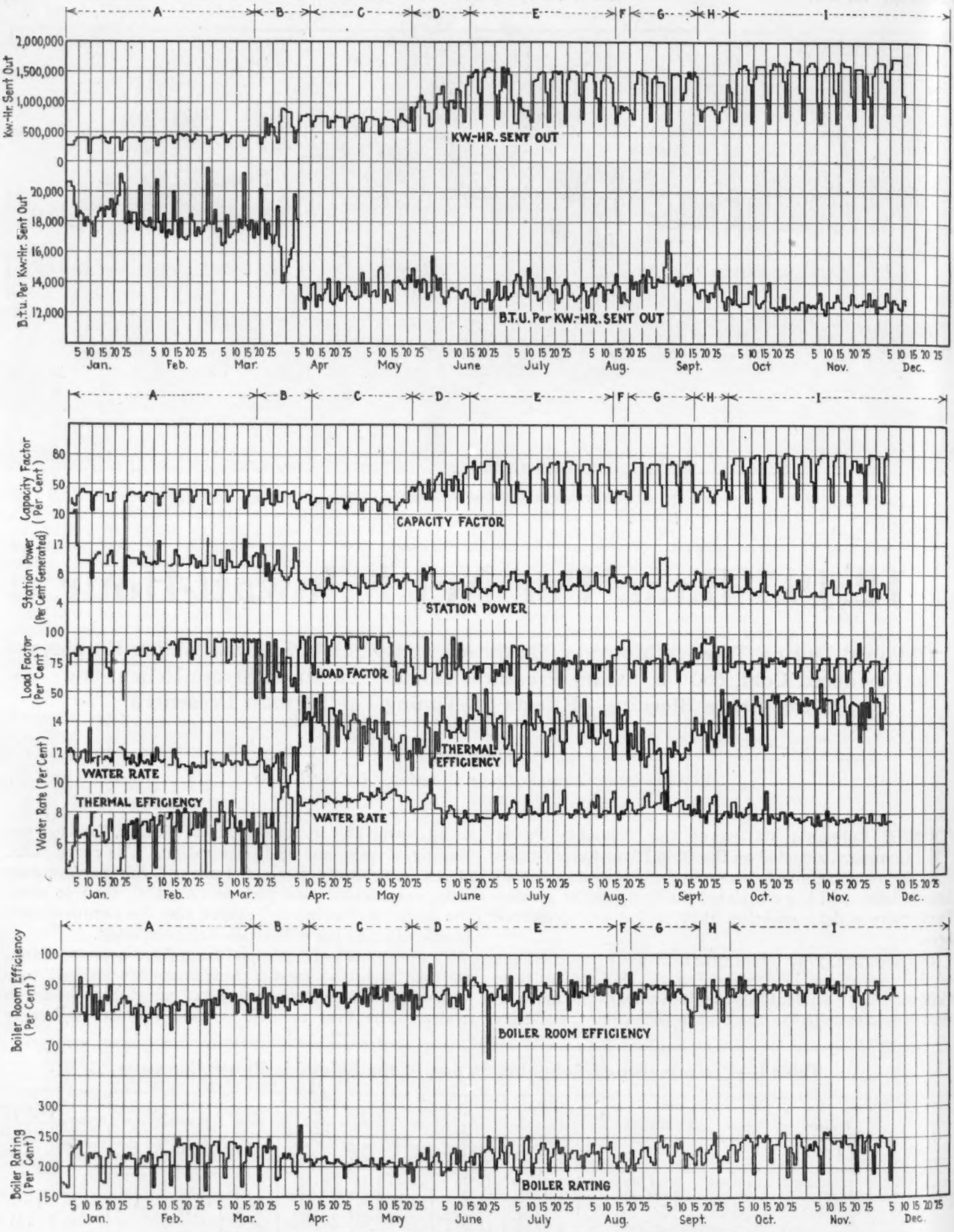
THE Columbia station of the Columbia Power Company, situated on the Ohio River twenty miles below Cincinnati, was put into operation about Jan. 1, 1926, and has completed the first year of service. Performance data covering that period are presented here.

The accompanying tables give monthly recapitulations of the operations beginning Jan. 1, 1926. The term "kilowatt-hour sendout" is used to indicate the net kilowatt-hours supplied to the transmission lines, exclusive of all power and light used in the station, for coal unloading, storage and coal preparation. The curve plats, which graphically present some of the performance data, are divided into periods (*A*, *B*, *C*, etc.) to show the so-called "tuning-up" stages and the improvements in operation as the difficulties were corrected.

Coal weights were obtained from three sources: First, railroad weights; second, weightometers on belt conveyors; and third, pulverized-coal weigh-bins hung on scales. The first method is used in loading barges

Table I—Performance of Columbia Station of the Columbia Power Company

1926	Kw.-Hr. Generated Total	Kw.-Hr. Sendout Total	Kw.-Hr. for Auxiliary Power	Station Power, Per Cent of Gen.	B.t.u. per Lb. Coal as Fired	B.t.u. per Kw.-Hr. Generated	B.t.u. per Kw.-Hr. Sendout	Lb. of Coal per Kw.-Hr. Generated	Lb. of Coal per Kw.-Hr. Sendout	Station Load Factor, Per Cent	Station Water Rate	Station Thermal Eff., Per Cent	Make-up Water, Per Cent	Kw.-Hr. per Ton Coal from Barge to Pulv. Bunkers
January	12,399,200	11,095,000	1,304,200	10.5	13,890	16,876	18,835	1.21	1.35	77.5	10.8	18.1	.....	.....
February	12,207,300	11,027,000	1,180,300	9.6	13,982	16,069	17,757	1.15	1.27	85.4	11.6	19.2	.....	.....
March	15,646,500	14,228,000	1,418,500	9.0	14,055	15,601	17,287	1.11	1.25	40.3	11.3	19.75	.....	.....
April	22,238,200	20,778,900	1,459,300	6.5	14,082	12,589	13,560	.894	.963	65.8	9.25	25.18	.....	.....
May	23,919,400	22,249,400	1,670,000	6.9	14,026	12,763	13,675	.91	.975	48.8	9.15	25.05	.....	25.32
June	37,513,600	35,169,300	2,344,300	6.2	13,972	12,309	13,119	.881	.939	56.7	8.05	26.02	.....	22.29
July	39,089,000	36,590,000	2,499,000	6.3	13,979	12,440	13,279	.89	.95	58.6	8.31	26.0	.....	22.10
August	37,994,200	35,497,300	2,496,900	6.5	13,828	12,638	13,523	.914	.978	58.6	8.45	25.21	1.85	22.02
September	34,879,700	32,548,700	2,331,000	6.6	13,754	12,873	13,809	.936	1.004	56.0	8.60	26.55	1.70	20.90
October Max.	.....	.....	.....	8.1	14,119	13,045	13,864	.951	1.03	91.0	10.0	28.0	6.8	27.13
October Av.	44,907,300	42,469,500	2,567,000	5.7	13,803	11,939	12,657	.865	.917	64.5	7.89	27.0	1.65	21.71
October Min.	.....	.....	.....	5.2	13,420	11,589	12,262	.834	.877	62.5	7.18	24.2	.22	17.75
November Max.	.....	.....	.....	7.36	13,970	12,520	13,910	.902	.972	93.0	8.08	28.4	2.72	26.07
November Av.	43,753,100	41,347,600	2,405,500	5.49	13,783	11,826	12,529	.858	.909	65.4	7.78	27.3	1.50	22.13
November Min.	.....	.....	.....	5.06	13,604	11,264	11,876	.824	.873	60.0	7.43	24.63	.91	18.30
December Max	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December Av	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December Min.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....



NINE DISTINCT PERIODS OF OPERATION INFLUENCED RESULTS OBTAINED

A.—During this period only one unit with the high-pressure cylinder cut out was operated. Steam was supplied to the low-pressure cylinder at about 500 lb. pressure and 650 deg. F. total temperature. The pressure was throttled by the governing valve of the turbine.

B.—No. 1 turbine continued operating on low-pressure cylinder, alone, and No. 2 turbine was started, using both high-pressure and low-pressure cylinders, but without reheat.

C.—No. 1 unit was shut down for work on the high-pressure cylinder, leaving No. 2 unit operating, as in period *B*. The load was increased and the steam pressure raised to 550 lb.

D.—No. 1 turbine was put into operation, using both high-pressure and low-pressure cylinders. Reheat was cut in on both units. The initial temperature of condensing water increased during periods *D* and *E*.

E.—Various station equipment was being tested. Changes in and improvements to furnaces and boilers were being made.

F.—No. 2 turbine was shut down for work on blading.

G.—No. 2 turbine was operated with two stages of blading cut out in the low-pressure cylinder.

H.—No. 2 turbine was shut down to reblade two stages in low-pressure cylinder. Steam pressure on No. 1 unit was increased to 575 lb.

I.—Starting Oct. 1, both turbines were operating complete with full reheat. All work on tests and changes to station equipment were finished.

Table II—Turbine Operation

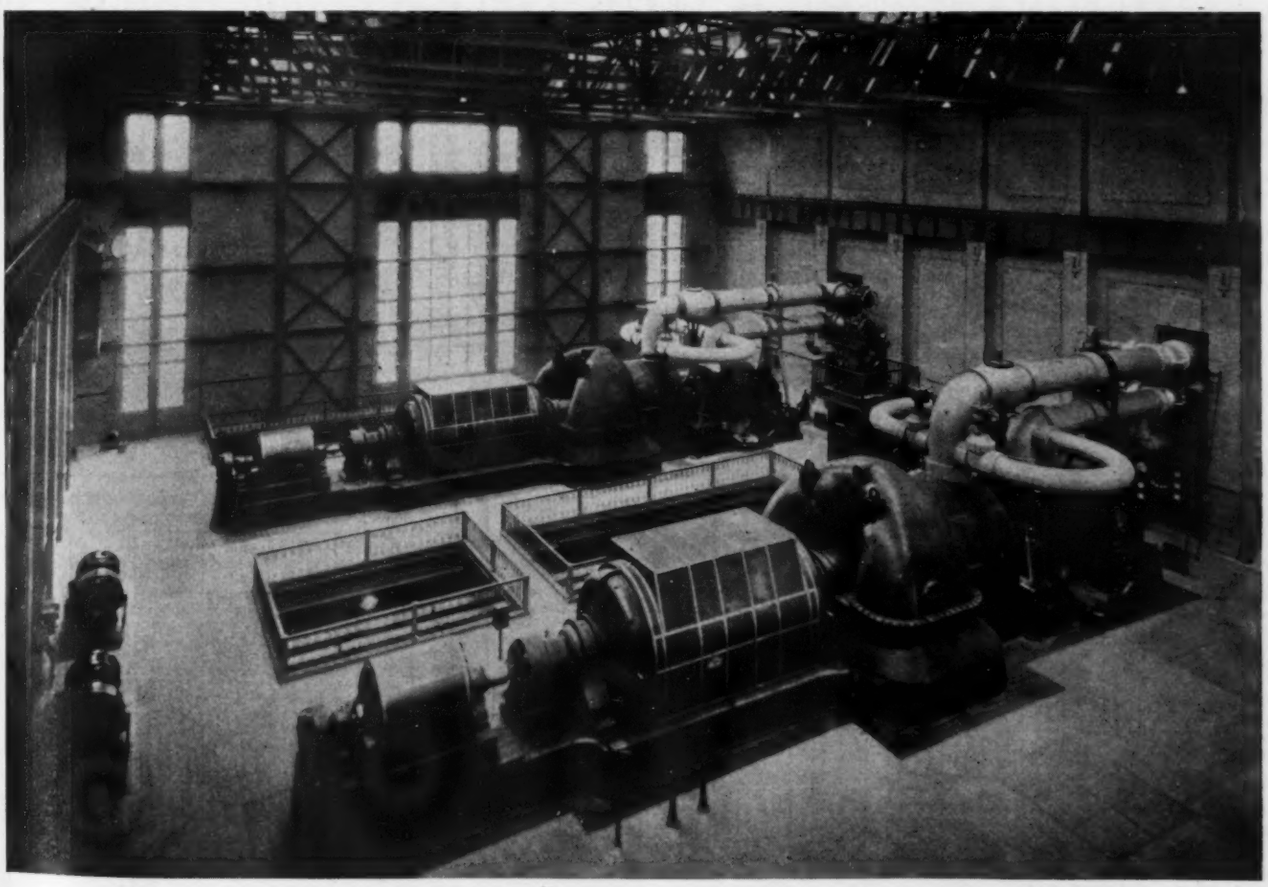
1926	Total Service Hours	Capacity Factor	High-Pressure Turbine				Low-Press. Turbine		Condensate Temperature (Deg. F.)					Barometer (In. of Hg.)	Vacuum Abs. Press. (In. of Hg.)	Turbine Water Rate per Kw.-Hr.	Condenser			Heat Transfer
																	Circulating Water			
			Steam Pressure at Throttle	Steam Pressure at Throttle (Deg. F.)	Steam Pressure Out	Steam Temp. Out (Deg. F.)	Steam Pressure Inlet	Steam Temp. Inlet (Deg. F.)	Hot Well	Generator Air Cooler	Low-Stage Heater	Interstage Heater	Gland-Leakage Heater				Inlet Temp.	Outlet Temp.	Gal. per Min.	
January	723.5	36.0	508	664	.....	.....	.....	.....	56	61	120	137	168	29.65	.67	10.5	33	44	30,900	164
February	672.0	40.5	509	680	.....	.....	.....	.....	55	61	117	154	180	29.59	.61	11.3	36	46	38,600	252
March	848.0	41.0	510	679	.....	.....	.....	.....	57	65	119	162	184	29.64	.64	11.1	38	48	38,400	200
April	786.0	60.5	457	692	.....	.....	.....	.....	67	75	125	166	184	29.60	.70	9.19	47	58	43,700	335
May	899.5	59.9	551	695	72	365	65	698	84	88	126	161	181	29.55	1.13	9.06	67	78	40,300	399
June	1205.0	58.1	555	684	80	358	71	719	88	93	132	166	187	29.58	1.37	7.97	73	82	48,600	392
July	1215.5	58.5	555	689	76	375	66	712	92	97	131	177	194	29.53	1.62	8.24	78	86	57,000	458
August	1151.5	56.7	568	693	80	377	70	693	91	100	131	176	198	29.66	1.67	8.39	76	86	50,800	403
September	1040.5	53.3	575	686	81	380	70	676	87	96	130	178	204	29.69	1.46	8.52	74	82	65,400	419
October Max.			588	728	85	412	76	718	87	94	133	188	208	29.75	1.24	9.51	70	77	77,619	486
October Av.	1256.0	67.08	579	702	76	389	67	705	78	87	130	176	197	29.60	1.06	7.85	61	70	56,000	362
October Min.			570	685	72	377	64	677	72	80	120	164	181	29.26	.90	7.45	51	61	42,800	257
November Max.			585	723	84	410	76	720	73	84	134	180	206	30.04	.95	8.08	50	62	48,500	381
November Av.	1209.0	67.4	578	712	77	395	68	708	69	81	129	176	195	29.72	.87	7.67	46	58	41,200	271
November Min.			565	692	72	385	65	672	67	75	120	168	188	29.29	.70	7.35	42	52	37,050	219
December Max.			.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December Av.			.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
December Min.			.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

from railroad cars at the river shipping point; these weights are used for billing purposes.

Performance during the month of October showed an economy of 12,657 B.t.u. per kilowatt-hour net sendout. The economy during November was 12,529 B.t.u. per kilowatt-hour sendout, and that for December, 12,495 B.t.u.

Since the station has been fully described before, no more than a brief statement of the features of station design and equipment is necessary now.

The turbine equipment consists of two General Electric tandem units rated at 45,000 kw. each. Each high-pressure element of fourteen stages is mounted on the same shaft with the low-pressure element of twelve stages. Initially the steam pressure at the throttle was 550 lb. and the total temperature was 725 deg. F., but the pressure has been raised to 600 lb. and the total temperature to 730 deg. F. The steam at a pressure of 110 lb. is reheated between the high-pressure and low-pressure cylinders to a temperature of 725 deg. Steam



TWO 45,000-KW. TANDEM TURBO-GENERATORS WITH STEAM REHEATED BETWEEN HIGH-PRESSURE AND LOW-PRESSURE CYLINDERS ARE BLED FROM THREE STAGES IN COLUMBIA STATION

Table III—Performance of Standard Boilers

1926		Hours Operation				Steam		Feed Water Temperature (Deg. F.)					Gas Temperature (Deg. F.)			Air Temperature (Deg. F.)						
		On Line	On Bank	In Service	Ratio Bank to Service (Per Cent)	Pressure	Temperature (Deg. F.)	Vapor Condenser	Open Heater	Deaerator	Economizer Inlet	Economizer Outlet	Boiler Inlet	Economizer Outlet	Air-Heater Outlet	Heater Inlet	Heater Outlet	Primary Air	Per Cent Boiler Rating	Efficiency 24-Hr. Boiler, Economizer, Heater, etc. (Per Cent)	Actual Evaporation (Lb. Water per Lb. Fuel)	Evaporation Factor for Boilers	Evaporation Factor for Boiler, Economizer and Superheater	Equivalent Evaporation (Boiler and Economizer) per Lb. Fuel
Jan.		1,562	177	1,740	11.0	508	670	183	201	192	193	325	559	318	244	78	237	253	193	82.0	9.64	1.078	1.207	11.74
Feb.		1,358	56	1,415	4.1	509	680	190	217	203	205	324	585	335	253	78	238	247	219	83.8	9.86	1.085	1.208	11.91
March		1,695	76	1,771	4.2	511	682	200	222	208	206	319	597	347	255	78	230	243	229	83.0	9.93	1.090	1.207	11.98
April		2,076	148	2,224	7.1	547	689	198	223	201	208	323	590	341	251	96	225	254	229	85.4	10.29	1.087	1.206	12.40
May		2,183	147	2,331	6.1	565	692	197	216	200	207	318	575	329	247	99	221	251	224	85.9	10.3	1.092	1.207	12.43
June		2,205	268	2,474	10.8	585	690	206	218	200	212	322	589	353	260	106	236	255	213	86.5	10.4	1.087	1.201	12.40
July		2,364	236	2,600	10.0	591	702	207	216	206	209	327	593	349	260	112	242	260	214	86.3	10.3	1.087	1.209	12.45
Aug.		2,419	329	2,749	11.9	595	713	210	218	206	212	322	592	348	257	112	242	263	215	86.2	10.4	1.080	1.204	12.52
Sept.		2,235	124	2,359	5.2	595	706	211	223	207	211	321	570	339	254	108	233	250	222	86.1	10.11	1.094	1.208	12.21
	Max.					630	744	217	223	214	217	337	630	406	275	120	246	255	255	92.6	10.76	1.123	1.242	13.07
Oct.	Av.	2,415	369	2,784	13.6	613	727	210	221	203	215	332	589	345	255	101	232	246	234	87.76	10.24	1.104	1.220	12.49
	Min.					606	712	198	210	187	207	317	539	311	238	73	182	218	175	79.4	9.42	1.060	1.204	12.12
	Max.					616	747	219	223	216	219	335	633	369	258	106	275	262	257	92.5	10.63	1.124	1.235	12.93
Nov.	Av.	2,304	353	2,657	13.6	615	731	210	218	211	210	324	594	350	248	92	230	250	233	89.4	10.3	1.105	1.224	12.72
	Min.					595	668	199	210	193	205	317	555	331	232	81	221	240	187	84.2	9.9	1.092	1.215	12.08
	Max.																							
Dec.	Av.																							
	Min.																							

Table IV—Data on Reheat Boilers

1926	Hours Operation				Steam		Feed Water Temp. (Deg. F.)		Gas Temp. (Deg. F.)					Air Temp. (Deg. F.)			Reheat Coils				Per Cent Rating of Standard Boiler	Efficiency 24-Hr. of Entire Unit (Per Cent)	Total Heat Absorbed (B.t.u per Lb. Coal)	Per Cent Total Absorption in Reheat	Per Cent Total in Economizer
																	Inlet		Outlet						
	On Line	On Bank	In Service	Ratio Bank to Service, per Ct.	Press.	Steam Temp. (Deg. F.)	Econ. Inlet	Econ. Outlet	Standard Boiler Outlet	Reheat Coils Outlet	Econ. Inlet	Econ. Outlet	Air Heater Outlet	Heater Inlet	Heater Outlet	Primary Air	Steam Press.	Steam Temp. (Deg. F.)	Steam Press.	Steam Temp. (Deg. F.)					
Jan.																									
Feb.																									
March																									
April																									
May	130	4	134	2.9	570	695	207	359	1,312	698	554	.....	263	106	251	284	69	365	68	698	302	83.9	11,773	31.3	68.7
June	854	38	992	3.8	585	699	212	353	1,367	625	599	.....	285	112	267	289	76	358	75	719	415	86.1	12,031	39.7	60.3
July	1,025	25	1,050	2.4	585	697	212	355	1,395	654	595	.....	268	114	247	270	72	375	70	712	397	91.0	12,693	32.6	67.4
Aug.	966	26	992	2.7	590	681	212	353	1,359	672	594	.....	274	112	252	272	76	377	73	693	380	91.6	12,596	36.6	63.4
Sept.	834	29	863	3.4	595	665	212	341	1,354	685	597	.....	288	114	250	266	76	380	74	676	386	87.8	12,083	33.1	66.8
Max.					617	700	219	360	1,460	785	650	400	297	137	272	278	82	405	80	725	580	93.0	12,780	37.4	69.9
Oct. Av.	1,127	49	1,176	4.17	605	665	217	350	1,365	719	596	388	278	102	247	256	73	389	70	705	399	87.6	12,100	33.4	66.6
Min.					590	640	205	325	1,250	665	550	332	220	75	200	242	70	380	68	680	294	81.0	11,080	30.1	62.6
Max.					608	720	216	370	1,420	780	630	398	290	106	262	277	82	410	89	720	435	95.0	13,010	36.0	70.7
Nov. Av.	1,126	23	1,149	2.0	620	685	213	355	1,343	691	607	364	263	92	246	257	74	395	71	708	398	87.2	12,020	33.0	67.0
Min.					590	660	210	340	1,224	620	570	340	189	77	241	240	70	385	68	672	271	78.0	10,832	29.3	64.0
Max.																									
Dec. Av.																									
Min.																									

Table V—Pulverizer House Operation

1926		Pulverized Coal Per Cent Fineness Mesh					Moisture in Coal (Per Cent) Daily Sample			Mill-Hours, Total	Mill Capacity (Tons per Hr.)	Drier-Hours, Total	Drier Capacity (Tons per Hr.)	Per Cent Coal Burned in Driers	Energy for Coal Preparation in Pulverizer House (Kw.-Hr. per Ton Coal)					
		40	50	100	150	200	To Drier	To Mills	Storage Bunker						Mills	For Air Compressors	Weighing Bin Pumps	Small Group	Total with Air	Total No Air
January		99	95	85	73	63	3.4	1.8	0.86	1,194	6.3	385	19.8	1.98	.....	.....	.....	.....	.....	.....
February		99	96	86	74	64	3.21	1.7	.78	1,037	6.8	346	20.4	1.02	.....	.....	.....	.....	.....	.....
March		99	96	85	75	64	3.36	1.8	.84	1,207	7.5	408	22.3	0.88	.....	.....	.....	.....	.....	.....
April		99	96	85	75	64	3.26	1.84	.90	1,361	7.3	314	30.8	.63	.....	.....	.....	.....	.....	.....
May		99	96	85	76	63	3.69	1.94	.93	1,531	7.2	361	30.5	.62	15.5	5.0	0.75	2.81	24.06	19.06
June		99	97	86	77	65	4.0	1.77	.86	2,303	7.2	629	26.4	.73	14.96	2.28	.76	2.68	20.70	18.41
July		99	97	87	78	69	3.27	1.67	.70	2,505	6.9	686	25.3	.58	15.65	2.27	.70	2.60	21.22	18.95
August		99	97	87	78	69	4.13	1.69	.66	2,339	7.4	696	24.8	.70	15.17	2.26	.80	2.67	20.90	18.64
September		99	97	88	78	68	4.36	1.75	.70	2,044	8.0	587	27.8	.92	14.05	2.39	.57	2.39	19.40	17.01
	Max.	100	99	94	87	75	5.69	2.19	1.43	.....	9.08	.....	41.32	.91	17.29	4.05	.80	3.84	23.64	20.94
October	Av.	99	97	87	79	69	4.10	1.79	.77	2,397	8.1	678	28.61	.70	14.45	2.54	.64	2.61	20.24	17.70
	Min.	99	96	84	75	64	2.66	.92	.35	.....	7.18	.....	22.02	.42	10.83	1.67	.38	2.05	16.00	14.19
	Max.	100	99	96	88	83	7.60	2.23	1.44	.....	8.59	.....	43.77	1.72	20.19	4.43	1.00	4.93	27.30	24.54
November	Av.	99	98	90	83	70	4.64	1.81	.84	2,494	7.55	744	25.2	.95	14.68	2.02	.65	3.06	20.41	18.39
	Min.	99	97	83	76	67	2.23	1.54	.59	.....	6.10	.....	15.25	.43	9.89	1.06	.51	1.95	17.01	15.50
	Max.																			
December	Av.																			
	Min.																			

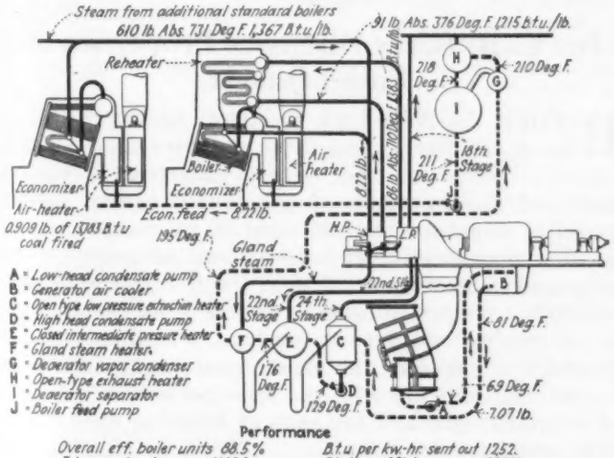
Table VI—Coal Handling Data

1926	Coal Analysis (Daily)				Kw.-Hr. per Ton Coal Handled				Coal in Storage (Tons)	Coal Received (Tons)
	B.t.u., Lb. Dry	B.t.u., Lb. as Fired	Moisture (Per Cent)	Ash (Per Cent)	River Hoist	Unloading Tower	Crusher House	Total, Yard		
January		13,890		7.96					12,143	7,350
February	14,100	13,982	.84	7.70					21,382	16,300
March	14,174	14,055	.84	7.49					26,987	14,732
April	14,210	14,082	.90	7.38					43,114	26,625
May	14,158	14,026	.93	7.62	.21	.19	.85	1.26	40,024	8,826
June	14,280	13,959	.86	7.80	.34	.19	1.04	1.58	35,367	12,889
July	14,077	13,979	.70	7.81	.19	.17	.52	.88	35,885	21,503
August	13,919	13,828	.66	8.41	.35	.18	.59	1.12	37,682	20,129
September	13,851	13,754	.70	8.85	.39	.15	.96	1.50	36,865	16,418
October Maximum	14,223	14,119	1.15	10.55	.46	.46	1.47	3.49		
October Average	13,991	13,803	.85	9.10	.31	.14	1.02	1.47	52,393	33,502
October Minimum	13,592	13,420	.51	7.48	.25	.09	.43	.92		
November Maximum	14,096	13,970	1.44	9.85	.51	1.32	1.91	2.21		
November Average	13,927	13,783	1.03	9.19	.33	.32	1.07	1.72	43,096	12,440
November Minimum	13,776	13,604	.59	8.05	.25	.16	.49	.93		
December Maximum										
December Average										
December Minimum										

is extracted from three stages—the 24th, 22d and 18th, for feed-water heating.

Four Babcock & Wilcox boilers are provided per turbine unit, each group consisting of three standard boilers and one reheat boiler. Each standard boiler unit contains 15,110 sq.ft. of heating surface, 3,184 sq.ft. of superheater surface, 7,300 sq.ft. of economizer surface and 9,885 sq.ft. of air-preheater surface. Each reheat boiler contains 6,066 sq.ft. of heating surface, 1,410 sq.ft. of superheater surface, 17,612 sq.ft. of reheat surface, 7,300 sq.ft. of economizer surface and 9,888 sq.ft. of air-preheater surface.

The furnaces are of the air-cooled refractory type, having a combustion space of 12,568 cu.ft. above the ashpits. The station uses pulverized fuel, all coal-preparation equipment and burners having been



SCHEMATIC PERFORMANCE DIAGRAM OF COLUMBIA STATION

furnished by the Fuller Lehigh Company. The coal-preparation equipment consists of six 57-in. and one 70-in. screen-type Fuller mills, two indirect pulverized coal-fired rotary driers and Fuller burners. Each furnace has nine vertical and six horizontal burners. Coal is received by barge and unloaded by a Mead-Morrison river unloading tower equipped with a four-ton grab bucket having a capacity of 375 tons per hour.

Power is generated at 13,200 volts and stepped up to 66,000 volts for transmission to Cincinnati and Dayton. A substation and transmission lines are under construction to permit transmitting power at 132,000 volts.

Farm Electrification—What of Its Future?

Cultivated Installations Will Stimulate—Large Usage Developed on Some Farms—Special Utility Personnel Significant—Financing and Rates Stabilizing—Some Needs of the Hour

An Interview with

DR. E. A. WHITE
Director of National Committee on Relation of Electricity to Agriculture

FROM a national viewpoint rural electrification has entered a new era. This has taken place in the past two years. Its desirability is now quite generally recognized. Where doubt and hesitation were once the dominant notes, today we find distinct indications of hope and determination. Rural electrification now exists in sufficient amount to insure its future growth if the farmers' desire for further electric service is stimulated by the present samples. Every rural line built not only takes service to a given number of farmers but it exposes a much larger group to the infection. Rural electrification is now nationally established. Perhaps only a small percentage of people are as yet thoroughly converted, but the seed is planted. If the soil is favorable, it will grow.

3,000 TO 18,000 KW.-HR. FOR SEVERAL FARMS

There are now at least one hundred known uses and possibilities for electricity in the rural community. Some writers have claimed more and may be entirely justified in the stand. It certainly is hoped that such is the case. But more significant than this array of individual operations is the success being attained in many types of farming through a combination of uses that results in an energy consumption attractive to the power company and a possibility for the farmers to make a little money with which to pay for energy, equipment and in some cases an improved living standard. True enough, this statement is based on the experiences of a relatively few farmers, but it is positive evidence that what has been done can, under similar circumstances, be repeated. We now have farms using 3,000, 6,000, 10,000 and even up to 18,000 kw.-hr. per year without an irrigation pumping load.

So much for possibilities. It can reasonably be asked, "What about average conditions?" One good user can-

not be expected to support a line. Fortunately it is coming to be recognized that an average consumption of 30 kw.-hr. per farm per month will not make rural electrification possible at rates that the farmer will consider reasonable. Cheap electricity on the farm means volume consumption, compared with previous average consumptions. Fortunately, electric light and power companies that are giving intelligent attention to load building report gratifying results. Average monthly consumption is building up under these conditions. It can now be said there are possibilities for building a satisfactory electrical load in many agricultural districts.

DR. E. A. WHITE

Of special significance has been the development of company organization and sales technique to handle this new class of business. In some cases rural electric service departments have been established, manned by a personnel selected specially for the work. It is too soon to give detailed reports on this venture, but it holds distinct promise. It appears to be sound because it is in harmony with the best practice to be found in other lines of electric light and power service. The rural service specialist promises progress in rural electrification.

Of equal importance has been the development of rate schedules and rules and regulations especially adapted to rural conditions. In both Wisconsin and Pennsylvania committees representing agriculture and power companies have sent joint memorandums to the regulatory commissions. In Wisconsin this resulted in the issuing of a rate schedule for rural service. In Pennsylvania a new schedule has been made by the commission. These experiences show that it is possible for representatives of agriculture and the electrical industry to come to an agreement even on the question of rates. The informal conference is often more effective than the formal hearing. The recent tendencies in rural rates is for the company to finance line construction, a somewhat higher minimum charge than has been generally used in the past, and a relatively rapid taper in the energy rates to give low-priced energy with large consumptions. The one-meter rate is gaining ground.

Future Needs

As to future needs, what can be done to insure the carrying forward of rural electrification along sound lines? In the first place, the great mass of data already secured through the state work, some of which has been made public and some of which has not, needs to be correlated, digested, condensed and made available. As far as it is humanly possible to do so, some things can now be put behind us. At least this can be done as soon as the summary is completed.

Load Must Be Cultivated

We need more power companies with carefully developed rural electrification policies and properly organized to put these policies into effect. It is one thing to be building some rural lines and taking on some farm customers. This is a splendid step, but rural electrification requires electricity at work upon the farm. Until this end is accomplished the job is not done. Of course, the farmer has a distinct responsibility here which no one else can or should attempt to assume, but by proper organization the power company can materially hasten this development. There is a proper way or ways for power companies to look after rural development. In the long run the proper way will be the most satisfactory from a financial or any other standpoint. Experience clearly indicates that the farm load will not develop without intelligent cultivation.

It is not enough that present equipment can be made to work. The potential market is big enough to demand the best adapted equipment (price considered) that engineering skill can produce. It would be of material assistance if engineers would be delegated by equipment manufacturers to make a specific study of requirements and possibilities. It may be argued that the project leaders are now doing this. Certainly, but this need not bar the commercial engineer. In fact, most of the significant new developments have come from co-operation between the college and commercial engineers. The viewpoint and the directness of the engineer outside of college walls are urgently needed to round out the engineering analysis that must be the backbone of rural electric development.

Dr. E. R. Berry Discusses Properties of Fused Quartz

BEFORE the New York Electrical Society recently, Dr. E. R. Berry, consulting engineer at the Lynn (Mass.) works of the General Electric Company, described the properties of clear fused quartz, giving practical demonstrations of some of its reactions. Its peculiar characteristic of failing to expand greatly when subjected to heat opens the way, Dr. Berry said, to new scientific advances in fields as remote from one another as astronomy and fire prevention. Fused quartz, he pointed out, is also the most transparent substance known, transmitting with the same perfection the rays of ordinary light and the rays of invisible ultra-violet light and infra-red light.

Commenting on the two applications of fused quartz named above, Dr. Berry said that it lent itself admirably to the process of grinding the exact mirror surfaces used in great telescopes and now made of glass under the difficulty imposed by that material becoming heated. For releasing water from automatic sprinkler systems with more certainty and less chance of accidental opening than is possible with existing devices, a small hollow capsule of the clear fused quartz is filled with a liquid which expands rapidly on rise of temperature. The quartz capsule does not expand. Accordingly, when the temperature increases suddenly, the liquid inside the quartz capsule swells and bursts its containing shell, opening the sprinkler by means of a mechanical device.

Common Sense in Specifications*

Suggestions for Correlation of Utility Purchasing and Engineering Departments to Simplify Specifications and Economical Purchasing of Materials and Equipment

IF A purchasing agent purchases wisely, he purchases most things, if not all things, on some sort of specifications. Since he cannot know† all about everything, he must depend on others to prepare his specifications for him. And there enters the difficulty. How can he tell whether the specifications prepared for him are of the common-sense variety?

Engineers are likely to get the point of view that the best is none too good, whereas the purchasing agent's point of view naturally is that that which is good enough is good enough. It is exactly at this point and in this way that the purchasing agent and the engineer split. The purchasing agent blames the engineer for his rank idealism, his noncommercial aspect, and he in turn blames the former for rank and blind commercialism. As usual in such cases, both sides are right and equally both sides are wrong. As usual in such cases, the difficulties can be ironed out satisfactorily if handled properly.

What is it that both engineers and purchasing agents are really trying to do? The engineer is trying to design and construct things that shall be useful, safe, efficient and not too costly. Purchasing agents are trying to obtain at reasonable cost the things required for such construction. To the extent that both are attempting to keep the cost to a minimum their ideas and their tasks run parallel. The trouble is that both cannot agree either as to the method or possible extent of cost reduction.

There is already a large volume of specifications covering the bulk of purchases with which the engineer is concerned. These are prepared by many different bodies, but the more important passes through the trial of fire, in that they must be approved by manufacturer, vender and user before being adopted. Such specifications as those of the American Society for Testing Materials and as the National American Standards adopted by the American Engineering Standards Committee will serve as examples. Now suppose that Mr. Engineer gives Mr. Purchasing Agent a freak specification for an article or material covered by one of the nationally accepted specifications. Certainly Mr. E. cannot take offense if Mr. P. A. asks him to explain why the standard material or equipment which many manufacturers are prepared to furnish is not good enough. And certainly he is no proper engineer if he does not produce a proper answer. There are exceptional cases where something better than the nationally accepted standard is required, but fortunately they are few and far between. Therefore it is Mr. P. A.'s job to make Mr. E. justify any departure from the standard articles of commerce.

This places on the purchasing agent the responsibility not only of being able to understand the engineer's reply but also of being able to argue with him. A purchasing agent may say that it is not fair; that he cannot be expected to understand technical engineering. However, if he is purchasing properly and in modern fashion, the purchasing procedure is every bit as technical as anything the engineer need present in an argument of this sort. Consequently it is just as fair that the purchasing agent should be able to understand the engineer as that he should be able to understand the purchasing agent.

The engineer engaged in pure engineering very frequently has little knowledge of market conditions, market usages, the finesse of trading and all those other things that form part and parcel of the purchasing agent's daily business life. It is necessary not only that purchasing agents realize this, as they undoubtedly do, but that they also take cognizance of its existence in the conduct of their work. The purchasing agent cannot hope to change the engineer over night by lecturing him, but he can accomplish a lot by discussing things in man-to-man fashion.

URGES THAT ENGINEERS SHOULD BE CONSULTED ON PURCHASES

"In other words," Mr. Hirshfeld advises purchasing agents, "take him [the engineer] into your confidence, tell him what the situation really is when viewed from the angle of the purchasing agent and endeavor to get him to thinking in terms of dollars and cents as you see them instead of as he sees them."

"Recognize that it is the engineer's responsibility to determine what shall be used and how it shall be

WITH the 1927 national budget for central-station construction nearly one billion dollars, the close association of utility purchasing and engineering departments in drawing up specifications offers possibility of effecting many economies in the purchase of material and equipment. Valuable suggestions as to how these two departments of the power companies can best correlate their work were made by C. F. Hirshfeld, chief of the Detroit Edison Company's research department, in an address before the third annual meeting of the public utility group of the National Association of Purchasing Agents in Detroit, Jan. 27 to 29. Mr. Hirshfeld in his address to the purchasing agents, which is abstracted here, pointed out practical methods for the simplification of specifications for materials and ways and means whereby the utility purchasing and engineering departments can work together to the advantage both of their company and of the manufacturer who supplies the material or apparatus.—*Editor.*

*High points of an address before public utility group of National Association of Purchasing Agents.

†It is not within human ability for any single individual to be a complete authority on possibly several thousand different things as widely separated as city and suburban real estate, building steel, steam turbines, weatherproof wire, underground cables, reinforcing steel, paints, motors, lamps and soap, to mention only a few.

used. Equally it is your responsibility to obtain as cheaply as is consistent with good purchasing policy that which is to be used. The fact that the responsibilities are thus divided makes a proper solution of the problem more difficult than if it were possible to place all responsibility on one individual. And in this almost axiomatic statement lies the solution of a good part of our trouble."

The best results will obtain when the two individuals recognize that best results are obtained when they function most nearly as though they were a single individual. This procedure cannot be effected so long as each party regards himself as entirely divorced from the other, so long as the engineer views the purchasing agent's function as starting where his ceases, and vice versa.

Characteristics of Common-Sense Specifications

1. Must be specific. A person cannot buy intelligently nor can a vender supply intelligently on a specification that is not specific.

2. Must not be unnecessarily restrictive. Such a characteristic will obviously limit the possible number of venders, and in this and other ways will tend to raise the price.

3. So far as possible they should conform with some nationally accepted specification covering the article or material in question.

Engineering Solutions Alternative

It is seldom the case that there are not several possible solutions of a problem open to an engineer. In fact, a great part of his time and effort is spent in deciding which of the possible solutions is the most promising or profitable. He will admit that in arriving at a decision between the different possibilities he does actually consider costs, dollars and cents. And he does, but he considers them frequently in a smaller way than he should. His ultimate solution may be a technically correct rather than a commercially correct solution in at least a great many cases.

Now suppose a purchasing agent had established such relations with the engineer that when the solution of the problem had been reduced to two or more possibilities, the latter just naturally walked into the purchasing agent's office, laid the final analyses on your table and said: "I have carried this problem as far as I care to as an engineer; I think that the remainder of the solution will be best made in conference with you." Life would really be much simpler for the purchasing agent if we are to believe his present protestations.

Some intelligent young engineers have had enough experience to enable them to appreciate the engineering viewpoint and the necessity for technically correct solutions, but who display reasonable commercial sense and possibly a little trading ability. If these men were made assistants to purchasing agents, charged, for example, with the study of markets, the facilities of different producers and the nationalization of specifications, the purchasing agent will very quickly develop some of the most effective imaginable tools.

"If you are wise in your choice of men," says Mr. Hirshfeld to purchasing agents, "or if you keep on changing until you find the right ones, you will probably be quite surprised to discover what extent of service such men can render you. Whatever else an engineer is, he is generally a logical thinker. Now it is my observation that logical thinking is not one of the characteristics of most purchasing departments. If I may be permitted to say so, the great effort seems to have been placed on the development of trading ability; the ability to maneuver the vender in some way into such a position that you scare him or coerce him into giving you some sort of price advantage or other equivalent concession.

"Have you ever endeavored to find out to what extent prospective venders mark up their real prices to give you the questionable satisfaction of 'persuading' them into a reduction?" Mr. Hirshfeld continued. "I have, and I find that experienced venders divide purchasing agents into groups, such as those who will expect a certain percentage reduction from the first quotation, those who will expect the vender to stand on his first quotation, those who can be made to swallow exorbitantly high prices, those who buy only on price irrespective of engineering recommendations or engineering values, those who can be persuaded through the engineering staff of their own company, and so on. And, gentlemen, the cleverer salesmen serve up to you exactly the sort of dish that your past performances lead them to think that you want.

I have seen very few purchasing organizations or departments that make any real effort to determine legitimate values and therefore prices, and fewer still that have any organization for doing such a thing. To be sure, lots of you have a rough-and-ready means of checking, such as average price per front foot in the case of real estate, average price per pound in the case of castings, and things of that sort, but that is not the kind of thing that I am talking about. I refer to real investigations which give you the fundamentals underlying legitimate prices and which are obtainable only through investigations that are probably more technical and complicated than those now commonly made by sales organizations for the purpose of determining sales opportunities."

Design Elements and Accessories Affect Prices Appreciably

For work of this sort the logically minded engineer is of great importance; the purchasing agent needs his training and his viewpoint. Such a man cannot go far in studies of this sort before he discovers what things tend to increase and what things tend to decrease legitimate prices for different articles of commerce. When such a man is part and parcel of a purchasing organization, he is not likely to permit his fellow engineer in the designing or requisitioning department to continue to specify ludicrously costly equipment or material when something less costly will do equally well.

Mr. Hirshfeld supplements this comment by saying: "I hold firmly to the idea that the person who is responsible for the use of a material or product is the person who should decide what its characteristics and properties shall be. Such things are no proper function of the purchasing agent. But I just as firmly believe that it is the latter's function to see to it that he receives specifications on which to purchase and that these shall be common-sense specifications."

Specifications for Residence Lighting Equipment

A COMMITTEE of the Association of Edison Illuminating Companies has prepared tentative specifications for guidance of central-station members in selecting residence lighting equipment for sale to the public. This committee includes representatives of seven central-station companies and has received the co-operation of a committee of the Illuminating Engineering Society which has sponsored those portions which have to do strictly with lighting qualities.

A preface to the specifications reads: "The purpose of these specifications is to promote improvement in artificial lighting in residences through the employment of lighting equipment which will render good service by providing convenient and effective illumination, with conservation of eyesight and enhanced decorative qualities." The specifications offer a method of appraising luminaires with respect to (a) illuminating qualities, (b) construction, and (c) appearance. Under the first head there is included a method of rating luminaires as to light output. There is also a method devised by the Illuminating Engineering Society committee for gaging luminaires as to glare. No lighting equipment which is unsafe or unduly glaring can be approved under these specifications. Lighting equipment which is satisfactory in these particulars may be graded as to excellence in the following particulars:

Illuminating Qualities	Construction	Appearance
Illuminating power	Mechanical	Lighted
Candlepower distribution	Electrical	Unlighted
Shadows	Assembly	
Glare	Accommodation of standard lamps	
	Finish	

For purposes of the Association of Edison Illuminating Companies a collection will be made of certain residence lighting equipment which attains high rating under these specifications. Copies of the specifications may be obtained from the Electrical Testing Laboratories, Eighteenth Street and East End Avenue, New York.

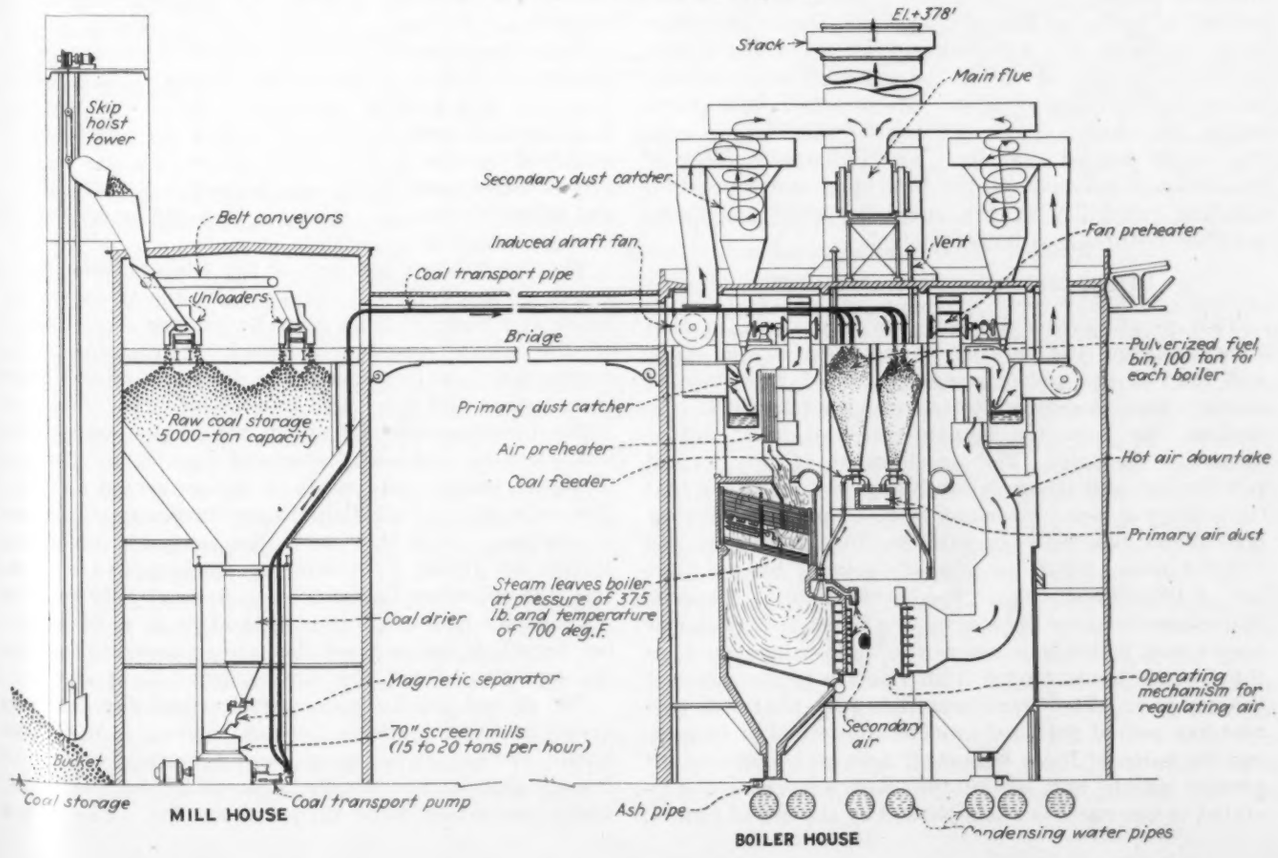
One-fourth of Switzerland's Water Power Is Now Utilized

ON THE occasion of the international power conference recently held at Basle the Swiss Federal Water Board published a report on the present state of water-power development in Switzerland. From this it appears that on Jan. 1, 1926, there was utilized in that country 560,000 hp., while hydro-electric plants then under construction were rated at 73,000 hp. or a total of 633,000 hp. On Jan. 1, 1914, the total constant water power available by Switzerland was 2,173,000 hp. and there was utilized in power stations 326,000 hp. Only about one-fourth of the Swiss water-power sites, therefore, have been developed. Of this development private undertakings represent 42.1 per cent.

The developed water power and that under development serve or will serve the following objects: Light and power, 61 per cent; electrochemical and metallurgical industries, 13.1 per cent; textile industry, 2.7 per cent; electric railways, 18 per cent; other objects, 5.2 per cent.

At present coal imports into Switzerland are about one-quarter smaller than before the war owing to water-power development.

Fuel-Preparing and Steam-Generating Equipment of the New East River Station of the New York Edison Company



High-Voltage Network Being Developed in Germany

Middle German 100,000-Volt System Links Number of Steam Plants Burning Lignite—Availability of Additional Electrical Power Opens New Industrial Territory

By Dr. ARTHUR HAMM
Electrical Engineer, Berlin

THE middle German 100,000-volt system is the incorporation of the ideas of two engineers, of whom one, Emil Rathenau, the founder of the Allegemeine Elektrizitäts Gesellschaft, was a great business man and the other, the lately deceased Prof. G. Klingenberg, a brilliant power-plant designer. Their idea was to convert the large stocks of nearly worthless lignite of middle Germany into cheap electrical current and thus attract industry. This industry should be able, because of the favorable supply of energy, to compete with the advantageously situated industry of the old industrial centers of Germany on the River Ruhr and in upper Silesia.

The success achieved in a few years is not only the result of the cheap generation of electrical energy; it is equally chargeable to the systematic development of the network and demonstrates to what degree it is possible to develop the industry of any country by a supply of electrical energy. This network joins all points of industrial importance to one another and to the brown coal power plants. The industrialist who wishes to settle in the territory can choose the place most favorable for him—in one of the large towns, or at the borders of one of the great streams, or near layers of important minerals. He is sure to find everywhere the electrical current at the same cheap rate and in the desired quantity. An extensive coupling of the different networks in the individual states provides absolute reliability of the current supply and keeps possible disturbances under control.

Interconnection Now Completed

This coupling was finished one year ago. At that time the large ring network of the Elektrowerke A. G. and that of the public power plants of the State of Saxony were closed by putting into operation the connection line from the transformer station at Silberstrasse to Leipzig. The development of this largest power-plant and transmission-line group has since that time taken a new, important step. The accompanying map shows this network with its lines for 50,000 and 100,000 volts, which at present includes nearly 2,500 km. of 100,000-volt lines. The development is of special importance because the source of all this energy is raw brown coal, which it is not worth while to transport, as the freight would be too high relative to the price of the product. The transformation into electrical current has proved the most economical method of increasing the value of these important natural treasures. At present nearly half of all the electrical current generated in Germany is accomplished by the use of lignite. Those power plants that burn bituminous coal are supplying only local peaks, whereas the brown coal power plants are taking over the base load.

In the middle German district the distribution networks of Greater Berlin, the Province of Brandenburg, the State of Saxony and the State of Saxony-Anhalt, which require enormous quantities of electrical current, are in connection with the ring network of middle Germany. This large ring main is fed by the power plants of the Elektrowerke and the State of Saxony. The largest share is that of the Elektrowerke A. G. at Berlin, together with that added by large power plants of Schornewitz-Golpa, Trattendorf and Lauta. These plants comprise at present nearly 400,000 installed kilowatts, of which about one-half is installed at Golpa. This plant was the largest steam-power plant in Germany until the Goldenberg-Werk of the Power Company of Rhineland-Westphalia put into operation its two new turbo-alternators of 50,000 kw. The Elektrowerke, with a generation of nearly 2,000,000,000 kw.-hr., is, however, Germany's largest supplier of electricity. It was established as a concern of the German Government to supply electrical current to the chemical industry of Bitterfeld, Piesteritz and Berlin, which is still a large consumer. After the war the Elektrowerke undertook to safeguard the providing of electrical current to Greater Berlin, which was in danger in consequence of the shortage of coal. The chemical industry demanded the main load and made possible an economical arrangement.

The 100,000-volt network of the Elektrowerke has a length of more than 1,000 km. In the main switch house at Friedrichsfelde, near Berlin, the central point of the whole closed-up network, it controls every engine that is to be connected or disconnected and every transformer and tap. Use is made of every means of communication—wire telephony, telegraphy, wired wireless telephony and postal telephone lines. They all serve to report immediately needs of the connected distribution networks and all disturbances in power plants and substations. Also they serve the central commanding station by giving all orders for working and by neutralizing working disturbances. A great help for this purpose are large indicators that show in a clear manner the whole network and that are arranged to indicate the condition of the distribution demands at all times.

The second great supplier of electrical current from brown coal of the middle German network is the Saxon public works. The main power house is that of Herschfelde, at the mouth of the Hercules coal mine, which comprises more than 100,000 kw. The Saxon

100,000-volt network was at first connected with Lauta, in the district of Leipzig, with Golpa-Schornewitz. At present the ring is closed at Silberstrasse, so that all points can be fed from two sides. In the Saxon network, too, the old central stations at Leipzig and Dresden, which burn bituminous coal, take over mainly the peak loads. The Saxon distributing network takes nearly half of the electrical current it requires, about 500,000,000 kw.-hr., from the 100,000-volt network.

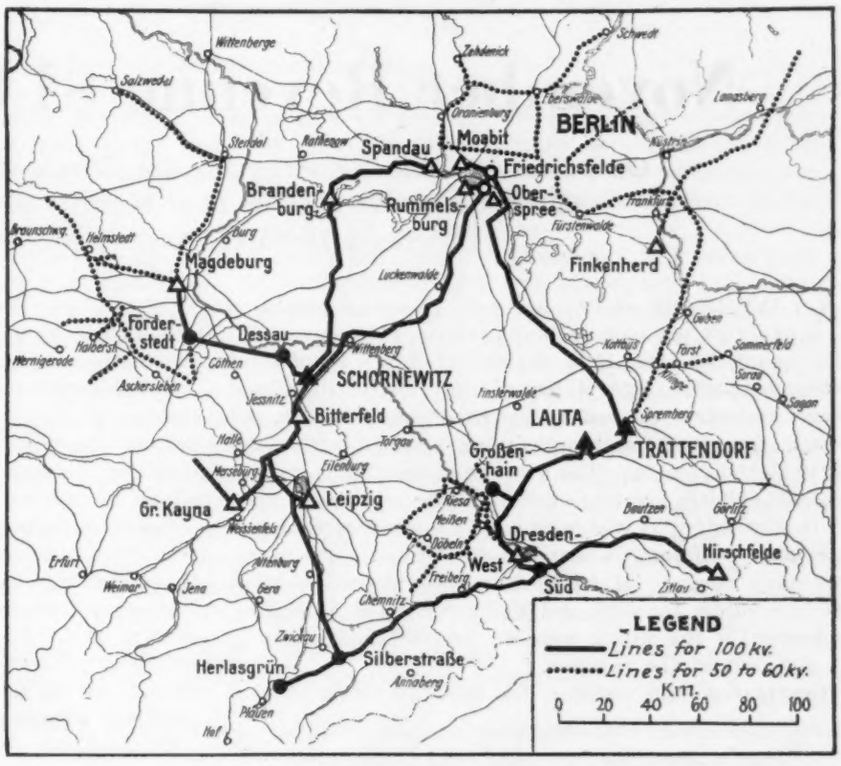
Berlin, as well as Saxony and the chemical industry, has already been called a main consumer of electrical energy. Here the 100,000-volt network works together with the power houses of Moabit, Rummelsburg and Aberspree (at the upper end of the accompanying map), which take over mainly the peak loads. Moabit serves too for regulation of voltage and power factor. The turbo-alternators of this power house generate the wattless current of the large distribution line. From these power houses and a special transformer station at Rummelsburg the current is carried over the Berlin underground network of 30,000 volts. At present the municipality of Berlin is erecting a second power house at Rummelsburg which now comprises three turbo-alternators of 80,000 kw. each and will ultimately include two additional turbo-alternators. The peak loads of this large city have become too great for the old power houses and will not be supplied from the transmission lines for economic reasons. Besides the two old lines for 100,000 volts that lead from Schornewitz and Lauta directly to Berlin, a third line has been built to Brandenburg and Spandau (a suburb of Berlin) and lately has been put into operation.

The Markisches Elektrizitätswerk is linked to the whole network by a 50,000-volt line, which leads to the power house at Trattendorf. Its plants, which supply electrical current to the northeastern part of the Province of Brandenburg, consist of an older power house near Eberswalde and a quite new one at Finkenherd, near Frankfurt. This plant burns brown coal obtained from its own mine.

A further important district is in the Province of Saxony. Here the distribution is in the hands of the Power Company of Sachsen-Anhalt (Esag). Its network is fed with 100,000 and 50,000 volts by several brown coal power houses, especially by Gross-Kayna and Harbke, which supply also the networks of Helmstedt and Braunschweig. The coal is procured from a mine near the power house.

The Turingen Power Company must also be mentioned here, because it supplies the current in the whole State of Thuringen from a 50,000-volt network. It is not yet connected to the 100,000-volt network, but soon will be, probably at Herlasgrun or Altenburg. It will also be linked with the 100,000-volt network of the Power Company of Bavaria in the south. The direct linking together of this large hydro-electric network with that of middle Germany will probably take place at Hof or Herlasgrun. This connection of two networks of nearly the same extension, of which one is fed only from water-power sources of primary energy, the other only from those of brown coal, is only a question of time and will save much of Germany's natural wealth of bituminous coal.

The individual power plants were erected at the time according to economic points of view. Klingenberg, who was the first to investigate this field systematically and scientifically, had found that the transportation of electrical current for the main load is cheaper than the transportation of the corresponding amount of coal. For supplying the peak load, however, the transportation of coal is cheaper than that of current. Therefore the power plants were erected at the mouths of the mines. The existing plants in the large towns, however, had to generate the peak loads by burning bituminous coal. Today the German engineers are abandoning this more economical way of thinking in favor of a more technical one. The great difficulties that the large power plants had on account of the shortage of sufficient cooling water and the necessity of erecting a great number of cooling towers, which could only partly alleviate the evil, have shown that the American practice is correct in erecting large power plants principally at the great streams or at a lake, where there is always sufficient condensing water.



GERMAN INTERCONNECTED ELECTRICAL SYSTEMS

It is interesting to observe the degree of reliability of such a large transmission line system and to compare it with American experiences, as published in the ELECTRICAL WORLD, May 8, 1926. It is evident that the supply of such large towns as Berlin, Leipzig and Dresden cannot be left open to the likelihood of line interruptions. The numerous connected mines, too, would be in danger of flooding if the electrical current for the

pumps should fail for any length of time. Statistics compiled by the Elektrowerke show that of all the disturbances of the power supply to Berlin, only a small part is chargeable to failures of the transmission lines. In 1924 and 1925 no interruption of 60 minutes or more has occurred; during 1924 168 interruptions altogether in the supply have been recorded. Of real interruptions of service only 37 have been recorded, and only nineteen of these interruptions are chargeable to the transmission line, the remaining eighteen disconnections being caused by the consumers themselves. During all these interruptions the current remained off on an average of less than fifteen minutes.

In spite of numerous lightning storms in 1924, interruptions in consequence of lightning were not recorded. Interruptions by sleet were likewise not recorded. The German engineers prefer the narrow square steel poles, in consideration of the high price of the right-of-way, which amounts to about $400 to $500 an acre. For an ordinary 100,000-volt pole not more than about 40 sq.ft. of ground per pole is considered necessary. It is seldom that transmission-line companies pay the land owner more than $10 or $12 for the soil occupied by a single pole. It is necessary to secure these poles carefully against rotary movement by the cables, where one or several on one side may become broken by sleet. Some years ago such cases happened frequently in the hilly countries of southern Germany, but now these forces are well under control. Besides a rather sturdy construction of the poles, use is made of a slide-clamp. As a result disturbances are checked and the transmission line becomes fully reliable.

November Revenue $146,500,000

Output of Electrical Energy for the Whole Country Exceeds 6,049,000,000 Kw.-Hr. in That Month—12.2 Per Cent Increase Reported Over Last Year

AN INCREASE of 12.2 per cent in energy generated and 10.3 per cent in revenue over the corresponding quantities for 1925 is indicated by reports of November, 1926, operations of the electric light and power industry received by the ELECTRICAL WORLD, the actual figures being, respectively, $146,500,000 and 6,049,270,000 kw.-hr. The average daily output, exceeding 201,600,000 kw.-hr., was the highest in the history of the industry; it was larger by 1.5 per cent than the previous maximum, established in October. The average daily revenue of $4,880,000 was exceeded only in the preceding January and February. The operating expenses for the month were $60,100,000, equivalent to 41 per cent of the revenue.

Contrasted with October, the monthly totals show a rise of 3.7 per cent in revenue and a decrease of 2 per cent in energy generated. The shorter month, with its two nationally observed holidays, required less energy for industrial purposes. But with reference to the lighting load the combined effect of holidays and shorter period of daylight was to increase the energy consumption and, correspondingly, that portion of the revenue which is received at the higher rates.

Another factor to be considered in comparing the relative movements of energy output and revenue is the time lag between the two. In large measure November's revenue is payment for October's energy consumption. Expenditures, on the contrary, are more nearly in phase with the physical operations. Over so short a period as a month the three are, therefore, not precisely comparable.

Of the total revenue, it is estimated that $93,600,000 was received for lighting, including the domestic and commercial loads, and $38,400,000 came from industrial power sales. The purchase of energy for resale continued close to 1,200,000,000 kw.-hr., but this may be an underestimate; the item is affected by lack of reports from some of the smaller companies which operate largely on purchased energy. The daily average was practically the same as in the two preceding months.

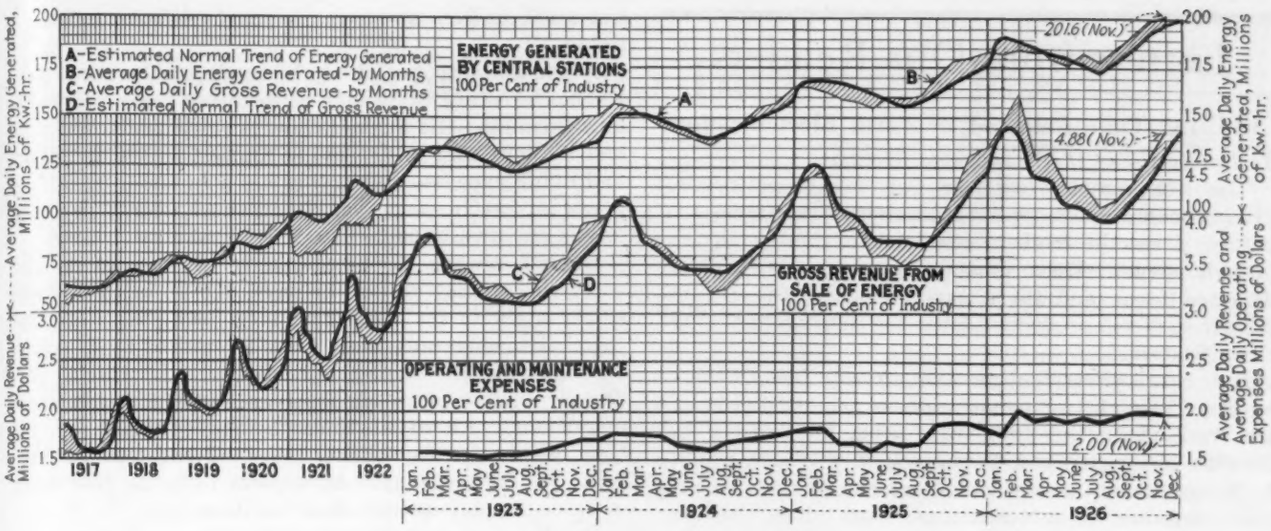
TABLE I—OPERATING RATIO OF CENTRAL-STATION COMPANIES

Month	Operating Ratio					
	Steam Plants		Hydro Plants		Combined Hydro and Steam Plants	
	1926	1925	1926	1925	1926	1925
August.....	51.8	51.5	38.7	36.0	44.8	45.3
September...	49.3	50.0	40.0	40.7	43.3	46.0
October.....	47.7	48.6	35.2	37.8	44.0	44.3
November...	44.5	44.3	34.5	33.5	41.9	42.8

TABLE II—GENERATION AND DISTRIBUTION OF CENTRAL-STATION ENERGY IN THE UNITED STATES
(100 per Cent of the Industry)

Month	Kw.-Hr. Generated Monthly *			Estimated Distribution of Energy Generated										Energy Purchased by Public Utilities for Resale, Kw.-Hr.	
				Total Energy Consumption by Central-Station Customers, Kw.-Hr.		Energy Consumed for Lighting, Kw.-Hr.		Energy Consumed for Power, Kw.-Hr.		Energy Sold to Electric Railways, Kw.-Hr.		Energy Used in Intracompany Business, Including Line Losses, Kw.-Hr.			
	1926 Thousands	1925 Thousands	Per Cent Inc.	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands
August...	5,777,753	5,085,379	+13.6	4,662,753	4,102,379	1,212,000	1,123,000	2,886,753	2,433,379	564,000	546,000	1,115,000	983,000	1,103,000	753,000
September	5,825,852	5,125,410	+13.6	4,700,852	4,136,410	1,188,000	1,102,000	2,966,852	2,506,410	546,000	528,000	1,125,000	989,000	1,190,000	797,000
October...	6,173,962	5,550,289	+11.2	4,980,962	4,478,289	1,262,000	1,168,000	3,148,000	2,760,289	570,000	550,000	1,193,000	1,072,000	1,230,000	955,000
November	6,049,270	5,391,857	+12.2	4,881,000	4,349,857	1,300,000	1,202,000	3,031,000	2,615,857	550,000	532,000	1,168,000	1,042,000	1,190,000	996,000

*Data on "energy generated" are those collected and published by the United States Geological Survey for all public utilities minus such data as are collected on energy generated by electric railway companies, reclamation service and manufacturing plants. The data are, therefore, for the electric light and power industry only.


A-Estimated Normal Trend of Energy Generated
B-Average Daily Energy Generated-by Months
C-Average Daily Gross Revenue-by Months
D-Estimated Normal Trend of Gross Revenue
ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
201.6 (Nov.)
4.88 (Nov.)
2.00 (Nov.)
Average Daily Energy Generated, Millions of Kw.-hr.
Average Daily Revenue and Average Daily Operating Expenses Millions of Dollars
1917 1918 1919 1920 1921 1922
1923 1924 1925 1926

AVERAGE DAILY OUTPUT BREAKS PREVIOUS RECORD

Of the total output, the portion that came from water power, 2,200,283,000 kw.-hr., was 14.9 per cent greater than in the previous November and 3.7 per cent above that of October, 1926. From fuel 3,848,987 kw.-hr. was generated, an increase of 10.7 per cent over November, 1925, but a decrease of 5.0 per cent from October. In daily averages the hydro outputs were 733,000,000 kw.-hr. in November, 1926; 638,000,000 kw.-hr. in November, 1925, and 683,000,000 kw.-hr. in October, 1926. From fuel the corresponding amounts are 1,283,000,000, 1,159,000,000 and 1,307,000,000 kw.-hr.

The 10.7 per cent increase from fuel-using plants required a less than proportionate increase in fuel consumption, again bearing testimony to the continued improvements in efficiency.

The consumption of the three chief fuels and the rates of increase compared with November, 1925, were: Coal, 3,202,822 tons, 4.6 per cent; fuel oil, 924,061 barrels, 24.3 per cent; natural gas, 3,897,619 thousands of cubic feet, 6.8 per cent decrease. Very considerable changes occurred from October to November. Coal consumption was lower by 117,000 tons and natural gas by almost a billion cubic feet, whereas nearly 46,000 more barrels of oil were used.

Regionally, the year's changes were in keeping with previous indications. In the Middle Atlantic and Mountain States the increase in energy output was close to the national average; in the Southern States, including the South Atlantic, East and West South Central, it was much higher; the Pacific States somewhat exceeded the average, while other regions fell below. A number of individual states, however, went wide of their regional averages, Rhode Island, Wisconsin, North Dakota, Delaware, West Virginia, North Carolina, Alabama, Florida, Oklahoma, Texas, New Mexico, Arizona and Washington showing large gains, while some others showed either minor gains or actual losses, reflecting the local industrial trends.

TABLE III—CENTRAL-STATION FINANCIAL OPERATIONS FOR FOUR MONTHS IN THE UNITED STATES

(100 per Cent of the Industry)

Month	Total Gross Revenue from Sale of Energy†			Estimated Distribution of Gross Revenue								Total Operating and Maintenance Expenses‡	
				Lighting Customers		Power Customers		Electric Railways		Other Public Utilities			
	1926 Thousands	1925 Thousands	Per Cent Inc.	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands	1926 Thousands	1925 Thousands
August	$127,800	$113,500	+12.5	$81,300	$75,200	$33,600	$28,300	$4,300	$4,200	$8,600	$5,800	$59,400	$53,200
September	132,300	116,300	+13.5	82,600	76,100	35,600	29,640	4,450	4,220	9,650	6,340	60,150	54,100
October	141,300	126,000	+12.1	88,400	81,100	38,400	33,300	4,600	4,400	9,900	7,200	61,700	56,200
November	146,500	132,800	+10.3	93,600	87,700	38,400	32,600	4,600	4,440	9,900	8,060	60,100	54,000

†Aggregate gross revenue from actual consumers, and sales to other public utilities for resale, involving a certain amount of duplication.
‡Do not include interest, taxes, depreciation or sinking fund.

TABLE IV—OPERATIONS OF CENTRAL-STATION HYDRO AND FUEL PLANTS IN THE UNITED STATES*

(100 per Cent of the Industry)

Month	Energy Generated						Fuel Consumption								
	Hydro-Plants			Fuel Power Plants			Coal			Oil			Gas		
	1926 Thousands of Kw.-Hr.	1925 Thousands of Kw.-Hr.	Per Cent Increase	1926 Thousands of Kw.-Hr.	1925 Thousands of Kw.-Hr.	Per Cent Increase	1926 Short Tons	1925 Short Tons	Per Cent Increase	1926 Barrels	1925 Barrels	Per Cent Increase	1926 Thousands of Cubic Feet	1925 Thousands of Cubic Feet	Per Cent Increase
August	2,062,629	1,735,369	+18.8	3,715,124	3,350,010	+10.9	3,060,647	2,975,728	+2.9	728,864	720,310	+ 1.2	5,403,316	4,801,130	+12.5
September	2,033,312	1,579,591	+28.5	3,792,540	3,545,819	+ 7.3	3,114,535	3,081,516	+1.1	883,913	769,918	+14.8	4,816,955	5,091,882	— 5.4
October	2,122,318	1,769,058	+19.9	4,051,644	3,781,231	+ 7.1	3,319,821	3,295,768	+0.7	878,270	811,475	+ 8.3	4,872,740	4,503,408	+ 8.2
November	2,200,283	1,915,694	+14.9	3,848,987	3,476,163	+10.7	3,202,822	3,062,335	+4.6	924,061	744,011	+24.3	3,897,619	4,182,000	— 6.8

*As collected by United States Geological Survey. The data are for the electric light and power industry only.

Letters from Our Readers

Utilizing Time Released by Farm Electrification

To the Editor of the ELECTRICAL WORLD:

The ELECTRICAL WORLD of Oct. 2 says editorially: "Experimental work on rural electrification shows that before it can be made a reality two things must be brought about. There must be more for electricity to do on a farm, and there must be some way for the farmer to use in productive labor the time saved through electrification."

But rural electrification has already been made a reality. Though twenty universities across the country are working on the problem of what the farmer can do with electricity and how much it will cost him to do it, and though power companies had planned to wait until definite recommendations from these workers could be obtained, the farmer's demands for electric service have grown so importunate that such delay is hardly possible. In some sections line building is going on as fast as safe financial programs and construction problems will allow. Whatever may be its possibilities for future development and expansion, rural electrification is already here.

"There must be more for electricity to do on the farm," declares the ELECTRICAL WORLD. In certain types of farming there is now little use for electricity outside of the household and lighting load. For these farms it will avail nothing to devise ways of doing things the farmer doesn't want done simply to use electricity. But in many places the farmer himself is seeing its possibilities and trying to adapt it to his own power needs. The general farmer, the dairy farmer and the poultry farmer have already found many practical uses for it.

The last part of the sentence, "and there must be some way for the farmer to use in productive labor the time saved through electrification," sounds plausible enough, but it allows the economics of the situation to blot out the sociological aspects entirely. No one asks today what the factory worker does with the new leisure that skillful management and the increased use of power have given him. No one expects him to take on a second job to make financial gain from his leisure. He already does more work and earns more money in his shorter day—and the hours after 5 o'clock are his for development and pleasure. We cannot expect electricity to give the farmer the eight-hour day. The nature of farm work makes that impossible, but if it can shorten his day from fifteen hours to twelve, it may give him some of the freedom other workers enjoy.

The Wisconsin Power & Light Company has among its customers a farmer who has made a definite attempt to shorten the hours of labor on his farm. He has accomplished it with a financial success that makes refreshing reading amid the tales of farm woes that wail through the press. W. J. Dougan was a Methodist minister for twelve years. Then deafness shut off that activity and he turned to farming. From slender beginnings he and his wife have built up a good dairy business, supplying high-grade milk to their neighboring town, Beloit. When Mr. Dougan started farming he painted these reminders high up on the wall of his silo inside his big round barn. "The aims of this farm: (1) Good crops; (2) proper storage; (3) profitable live stock; (4) a stable market; (5) life as well as a living."

From the very beginning he made his farming pay. He has a record of twenty consecutive years of profitable farming. His business now is worth about $56,000, and he finds that after paying himself $3,300 in salary and living expenses and giving his men one-third of the gross income in wages he still realizes over 8 per cent on the net investment.

He has always employed plenty of men to do the work well. They do not, he says, get up in the middle of the night to eat breakfast; they have plenty of time for their meals—and their work is finished by 6 o'clock at night. Even though he runs a dairy farm, Mr. Dougan finds a place for observance of the fourth commandment. All of his men have one-seventh of the time off—half a day during the week and part of Sunday. As farm manager he expects to be as free from work on Sunday as any other business man.

Mr. Dougan electrified his farm some thirteen years ago—long before rural electrification became an issue and a project for the country at large. His use of power is not an artificially stimulated thing. It has developed as he found a profitable place for it in his farm management. Leisure for work and pleasure outside her home comes to Mrs. Dougan, because she has no lamps to clean, because electricity washes her clothes and her dishes, does her ironing, her cleaning and a part of her cooking. Here 10,000 kw.-hr. of electrical energy a year does much of the work and provides leisure for the men and women on the farm.

And what do they do with the leisure thus gained? What do you do with yours?

E. R. MEACHAM,
Director of Rural Service.

Wisconsin Power & Light Company,
Madison, Wis.

Value of Shaded Light Should Be Emphasized

To the Editor of the ELECTRICAL WORLD:

I wish to commend your recent editorials dealing with the subjects of house wiring and home lighting. You are touching upon a subject of vital interest to the electrical industry, and at a most opportune time, owing to the convention and exhibition of lighting equipment which has just been held in Cleveland. It seems to me that this exhibition and convention have provided a wonderful opportunity for constructive action of far-reaching scope. There seems no reason why these lighting equipment and fixture men, coming from all parts of the country, should not get together on a nation-wide educational program of better home lighting with special emphasis on the subject of "shaded light." At the same time, they would be rendering a decided service if they could take steps to do away with a lot of hybrid fixture designs.

In this connection recognition should be given to the fact that while a great many people still prefer ceiling fixtures for their living rooms and bedrooms, there is a decided trend toward lighting these rooms by wall-bracket fixtures. With the use of the new inside-frosted lamps in these fixtures, there arises a greater need than ever for proper shading. A national educational campaign of the kind mentioned would be a great business builder for practically all groups of the industry, and I earnestly hope that some big constructive movement along the lines mentioned will come out of this Cleveland convention.

G. W. WESTON,
Secretary-Manager.

Kansas City Electric Club,
Kansas City, Mo.

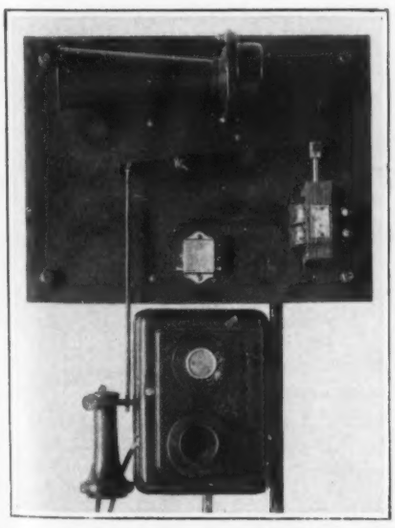
Central Station and Industrial Practice

Automatic Signaling Over Ordinary Telephone

BY E. F. PEARSON and F. M. LEWIS
Electrical Engineer and Assistant Engineer, respectively, Northwestern Electric Company, Portland, Ore.

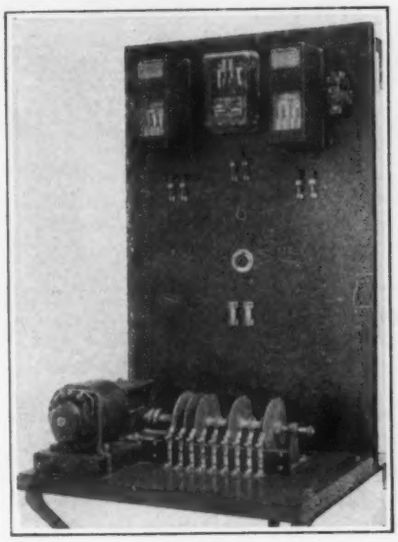
THROUGH the medium of standard relays, a motor-driven code wheel and a solenoid for lifting the telephone receiver in unattended substations, the load dispatcher of the Northwestern Electric Company is advised of abnormal conditions and restoration of normal conditions in these substations. The system is designed to cover substations equipped with automatic selective transfer on two incoming supply lines and periodic reclosing apparatus on the outgoing feeders, and makes use of the ordinary local telephone to transfer automatically sixteen code signals per substation to the dispatcher's office with no electrical connection necessary between the signal relays and the telephone circuit.

Two buzzers are used, one having a low-pitched and the other a high-pitched note. These buzzers are mounted on the substation wall near the telephone as illustrated. Signals



REMOTE SIGNALING SYSTEM USING LOCAL TELEPHONE

The solenoid on the board above the telephone lifts the receiver through the lever arm. The siren mounted at the top of the board emits a low-pitched code signal while trouble persists on any of the station apparatus. If the trouble is cleared before the code-sending apparatus is reset, a high-pitched code signal is sent over the telephone by the small buzzer just above the telephone.



RELAYS AND MOTOR-DRIVEN CODE WHEELS USED IN CONJUNCTION WITH REMOTE SIGNALING OVER TELEPHONE

are sounded in a series of short and long dashes that indicate the name of the station and the number of the unit in trouble. The code is transmitted slowly and can easily be read. Trouble on feeders, supply lines and buses is indicated through low-voltage relays; the transformers indicate through temperature relays. The method of operation is as follows:

Assume that a short circuit on an outgoing feeder has automatically tripped a feeder circuit breaker. A voltage-failure relay connected to this feeder closes a 12-volt battery supply to a series of motor-driven code wheels (shown in the accompanying illustration), which in turn supply the necessary impulses and consequently sound the number of the feeder on the low-note buzzer. At the same time an auxiliary relay opens and de-energizes an alternating-current solenoid, which then raises the telephone receiver hook through lever action. The receiver being lifted, the indicating lamp on the company's private-branch exchange switchboard lights, indicating a call. The operator listens in and upon hearing a code signal transfers the call to the load dispatcher.

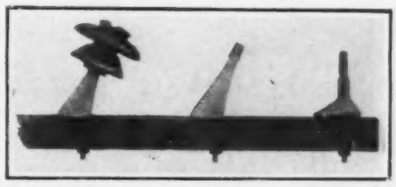
Assuming that the trouble on the outgoing feeder was of transient character, the periodic reclosing apparatus closes the feeder circuit breaker, restoring the feeder to a normal basis. A second relay will then automatically transfer the code from the low-note buzzer to the high-note buzzer, which sounds the code number of the feeder and thus indicates that the feeder has restored itself to normal condition. The signaling apparatus operates continuously, repeating the code for a predetermined time, which may be set at from 10 to 30 minutes. When it ceases operating it automatically resets ready for the next emergency.

By using the local telephone in this manner there is no violation of telephone regulations and the phone can be used for conversation in the usual manner. When desired the operator may transfer the call to the substation superintendent's office or to his home in case he wishes to check the number of the unit or listen for the "all clear" signal. This apparatus installed ready to operate through its full range of signals cost the company approximately $825 per substation.

Inclined Pins Reduce Angle Construction Cost

BY E. Y. PORTER
Distribution Engineer Southern Sierras Power Company, Riverside, Cal.

IT IS customary in transmission and distribution line construction work to use double arms at angles less than approximately 60 deg. in order to utilize the strength of more than a single pin where pin-type in-



TWO TYPES OF PINS FOR USE AT ANGLE POINTS IN LINE CONSTRUCTION

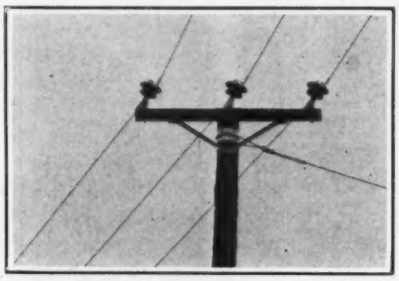
sulators are used. Frequently even with two pins supporting each conductor the results are unsatisfactory, since the side strain is often sufficient to bend or break the pins, or in course of time the pins and arms may become distorted. This is especially true with higher voltage lines, where the height of pins above the arm and the larger insulators in-

troduce greater leverages. Long spans also are more common in the higher voltage lines and conductors are generally strung to greater tensions.

Various devices have been developed to support the conductor at such angle points, the most common being some type of dead-end insulator used in direct tension. Such dead-ends are relatively expensive, and in addition special insulators and fittings usually involve cutting the line conductor with resultant waste of material and labor.

To obviate these difficulties and objections the writer has devised and successfully used the angle pin illustrated. It is simply an insulator pin of rigid construction having a base of ample proportions to give a large bearing surface on the crossarm and with the supporting bolt offset from the base center. The axis of the pin and insulator is inclined at an angle of about 25 deg. from the vertical in a direction toward the exterior angle of the line conductor or opposite to the side strain. Lead threads are die cast on the pin.

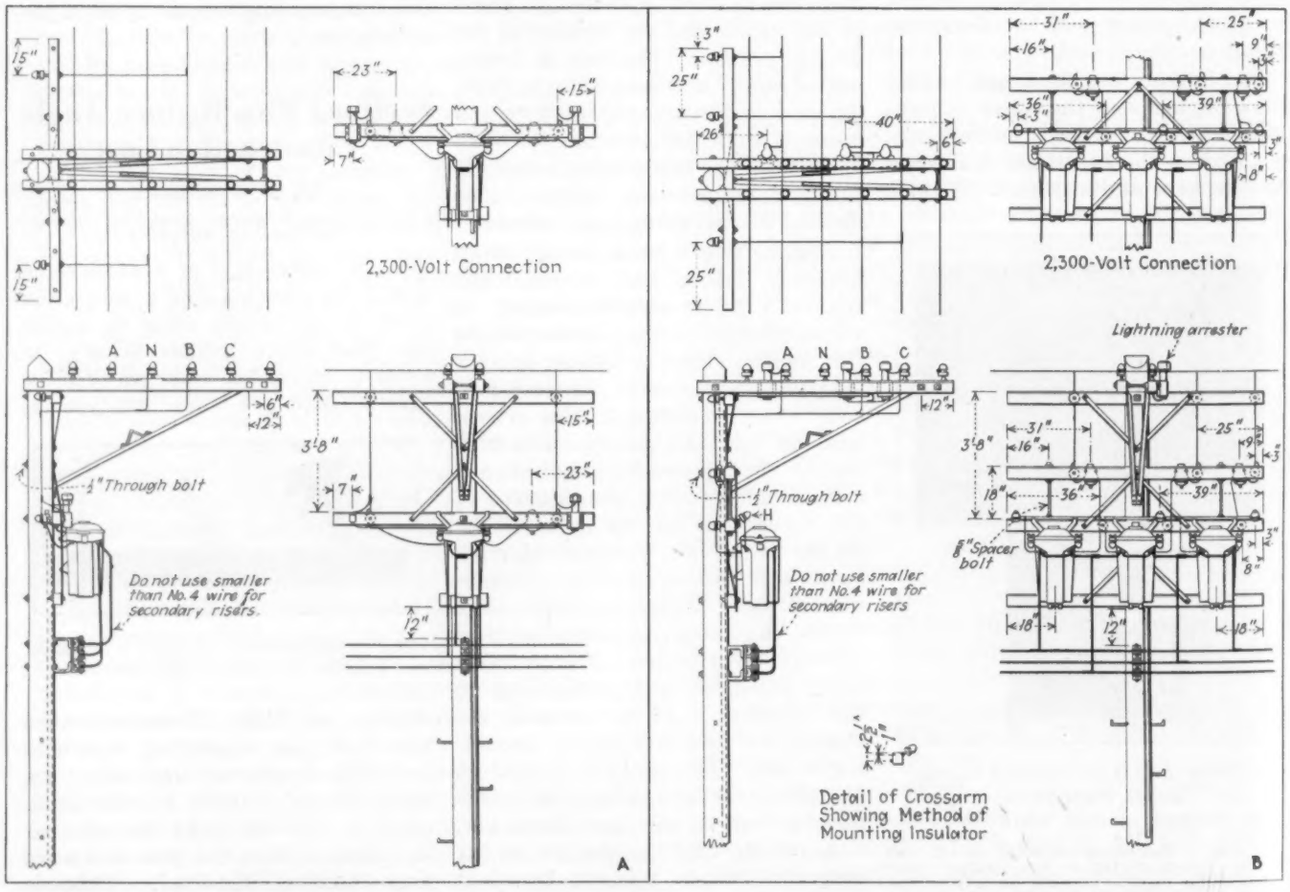
It will readily be evident that this construction provides a combination of pin and insulator in which the resultant force exerted by the combined vertical weight component and horizontal tension component due to angle in the line will lie approximately along the axis of the pin and insulator and will tend to hold the insulator on the pin rather than to bend the pin and pull the insulator off. Theoretically the pin should be inclined at an angle such that the resultant of forces will lie exactly in the pin axis, and it is entirely practicable to construct such a pin in two mutually adjustable parts, but this refinement has not been found necessary, since the rigid pin inclined at an angle of about 25 deg. successfully meets all practical conditions and is less likely to be used improperly. It is evident that the cost will be very much less than dead-end construction and less even than standard straight vertical axis pins, since single instead of double arms can be used in many cases.



SINGLE-ARM CONSTRUCTION, USING INCLINED-AXIS PIN AT 15 DEG. ANGLE ON 33-KV. NO. 2/0 LINE

The writer recently designed and erected a 33,000-volt line consisting of three No. 2/0 bare hard-drawn stranded copper conductors, on 45-ft. poles with average spans of 330 ft. A portion of the line was over rather rough terrain, where numerous angles were necessary. Angles up to 15 deg. were turned on single arms and angle pins. Angles above 15 deg. and up to 60 deg. were made

Side-Arm Transformer Installation



TWO STANDARDS recently issued by the West Penn Power Company are illustrated. A shows a 2,300-volt-4,000 - volt/230 - 115 - volt single-phase transformer installation on side-arm construction with a 15-kva. or smaller transformer. B shows a 2,300-volt-4,000-volt/230-volt three-phase transformer installation arranged on a somewhat similar side-arm construction for three 15-kva. transformers or a group of smaller size units.

with double arms and angle pins. Angles over 60 deg. were dead-ended. Conductors were strung to a tension of 1,600 lb. at 60 deg. F. Experience with this and many other lines over a period of several years has demonstrated that the limit of strength is in the crossarms and fittings rather than the angle pins and standard insulators used.

A modification of the angle pin described in which the axis is vertical but with the bolt offset in the base has been put on the market by a well-known manufacturer of line hardware. Either form will support a horizontal strain of 3,000 lb. at the center of the threaded portion on a 10-in. pin. Both types of pin as well as an actual installation of the angle pin are illustrated.

The angle pin described is available in high-grade malleable iron and its use has been standard practice with the Southern Sierras Power Company for the past five years, resulting in considerable savings and improved construction.

Oil Breakers for Changing Transformer Connections

BY I. C. ROBERTS
Assistant Engineer Portland Electric Power Company, Portland, Ore.

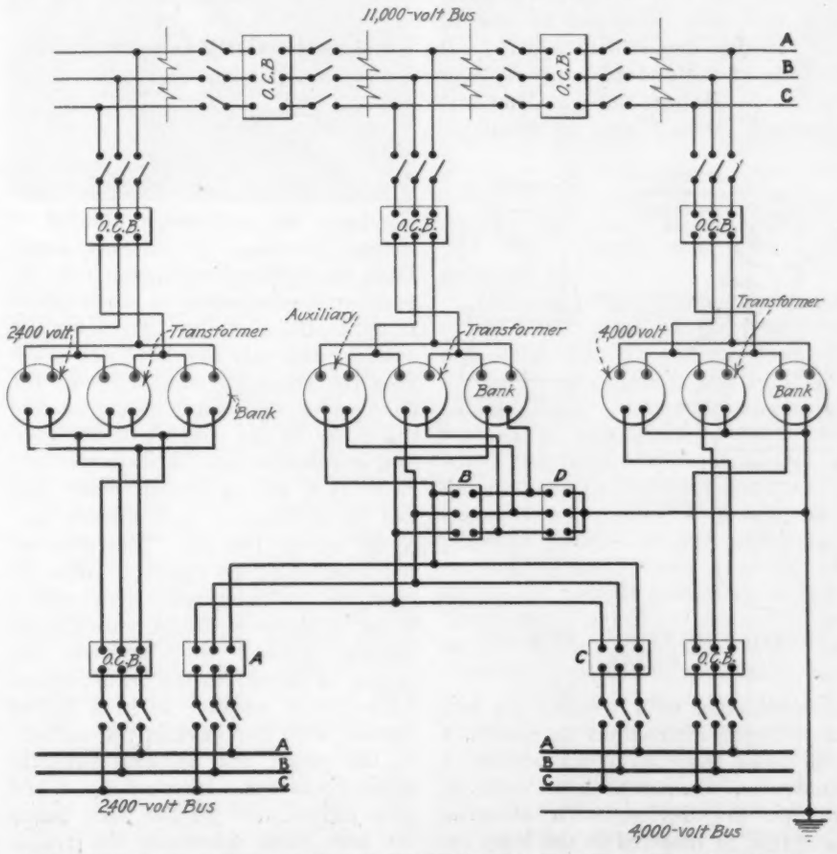
IN ONE of the substations of the Portland Electric Power Company it became necessary to maintain two distribution voltages, one for 2,400-volt and one for 4,000-volt feeders. The 2,400-volt bus is supplied by three single-phase, 11,000/2,400-volt transformers, connected delta on the low side, and the 4,000-volt bus is supplied by a similar bank of transformers connected Y on the low side.

Desirability of a spare transformer bank introduced a rather complicated switching problem on the low-voltage side of the spare bank due to the fact that for feeding the 2,400-volt bus a delta connection would be required, whereas for the 4,000-volt bus the connection would be Y. The idea of using disconnecting switches was discarded because of the special arrangement of switches required and the possibility of accident in case the switches were opened under load. This led to use of interlocked oil circuit breakers connected as illustrated. Breakers *A* and *B* operate as a unit and can be closed only when breakers *C* and *D* are open, and vice versa.

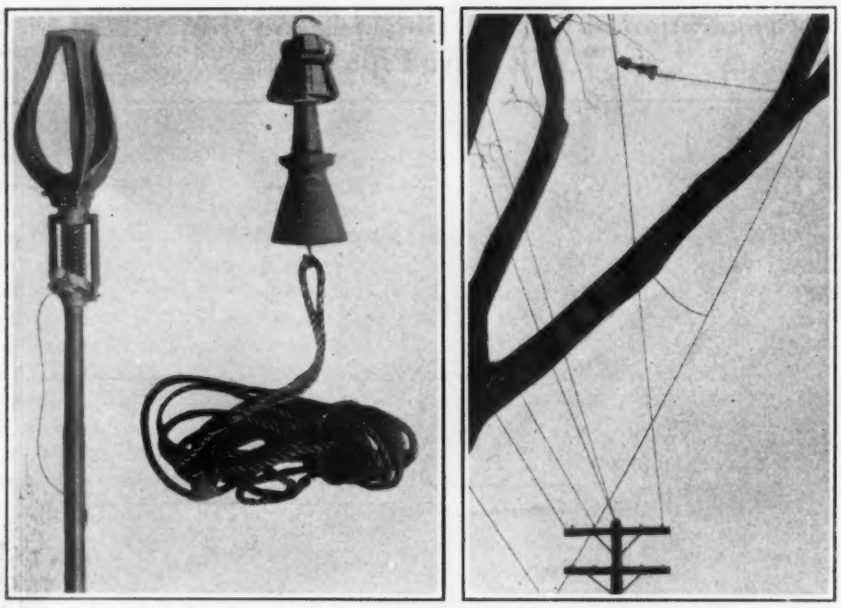
Provision for synchronizing was necessary because the 11-kv. bus may be sectionalized. This was accomplished by magnetizing the transformers from the low-voltage bus and performing the actual synchronizing with the 11-kv. breaker. The only protection provided for the auxiliary bank was overload relays on the 11-kv. side, as the bank will be used comparatively little.

Preparation of Cut and Blocking for Mud Sills of Wood Stave Pipe Line

Jackman hydro-electric development of New England Public Service Company near Manchester, N. H.



INTERLOCKED OIL CIRCUIT BREAKERS FOR CHANGING TRANSFORMER CONNECTIONS

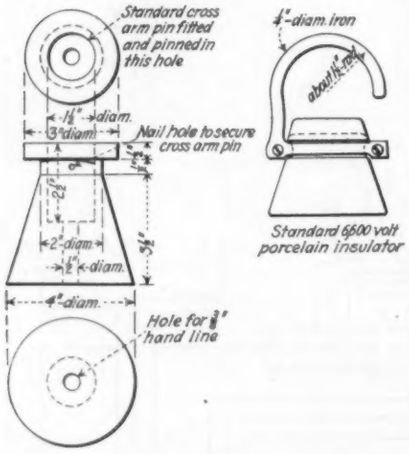


AT LEFT—LAMP REPLACER, INSULATED HOOK AND HAND LINE.
AT RIGHT—WIRE PULLED OFF TREE

Clearing Tree Grounds Safely

BY F. A. WOOD
General Superintendent Beverly Gas & Electric Company, Beverly, Mass.

TO ENABLE tree grounds to be removed without climbing trunks or limbs—an operation that has always been hazardous in wet weather—the device illustrated herewith has been developed by one of our trouble-department men. It consists of a standard lamp replacer (G. C. A. Manufacturing Company, Pittsfield, Mass.) and an insulated



WORKING DRAWING OF HOOK AND HOLDER

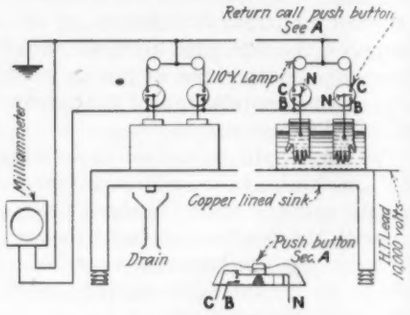
hook attached to a wooden pin and holder with dimensions as shown, a rope being fastened to the bottom of the device. On reaching the scene of trouble, the device, with attached hand line, is inserted in the lamp replacer. From the ground or from a ladder or truck the insulated hook at the top is hooked over the grounded wire, the lamp replacer removed and the hand line used to pull the wire away from the tree or limb. The line is made fast to any convenient object until the maintenance crew can make permanent reconstruction.

Safeguarding Glove Tests

BY G. M. HARDY
General Superintendent
Worcester Electric Light Company

IN TESTING rubber gloves the Worcester (Mass.) Electric Light Company has adopted a number of safety features of interest apart from the routine work required. All tests are conducted in a fireproof room at the Faraday Street service station, and only two keys are available for entrance, one being in the custody of the meter engineer and the other in the cabinet of the general superintendent. Within the test room is a 10-kva. transformer that can be utilized to test various material up to 100 kv. The door of the room must be closed in order to energize the primary, a door switch being in series with the main circuit breaker control that governs the supply of energy to the transformer. This circuit breaker is in a locked cabinet with two keys in the custody of the meter and general superintendent's offices. Incidentally, a red pilot light burns on the floor below the test room whenever the transformer is in service, as high-tension leads are run through floor bushings, as required for other than glove tests outside the test room itself.

Within the test room the glove-testing tanks are wired as shown in the accompanying diagram. The test tanks enable six pairs of gloves to be tested with great rapidity. The tanks are mounted in a copper-lined sink supported on insulators and set apart from the rest of the room by a pipe railing. Milliammeter readings are made by pushing a return call button above each suspended glove,



WIRING OF GLOVE-TESTING STAND AT WORCESTER

the pushing being done by a rod of impregnated wood in the hands of the test man, who stands outside the rail and notes the instrument reading from a safe distance. These push-button sticks are also used in lifting the chains off the terminals above the gloves and dropping them into the gloves when a glove fails. In this way no delay is caused in testing a full set of gloves and the chain, when dropped, serves as a marker. The pilot lamps above the gloves and the milliammeter are on the ground side of the test circuit, and the drain of the sink carrying the testing tanks is of course never used except when the circuit is dead.

Cost of Installing Reactor Group

IN 1925 a New England central station installed three 60-cycle, concrete, indoor-type, 14.6-kva. current-limiting reactors on the rectifier bus of a city substation at the following itemized cost:

Three reactors	$686.91
Twin conductor cable, No. 4, 200 ft.	129.06
Construction of concrete barriers for cells	227.00
Installing bushing, bolt, screw and adjustable link work	1.17
Installing reactors	275.00
Teaming	46.70
Engineering expense	57.77
Total	$1,423.61

Commercial Activities and Public Relations

Public Contact Afforded by Opening of Hudson Station

Brooklyn Edison Company's New Generating Plant Provides a Text for President Sloan of the Company and Chairman Prendergast of the New York Commission

FORMAL opening* of the Hudson Avenue station of the Brooklyn Edison Company last week, with its thousand or so invited guests, including public utility commissioners, city officials, bankers, business men, industrialists and other representative citizens of Greater New York, provided the company with an excellent opportunity to convey to the public directly or indirectly some of its aims, ideals and policies.

Addressing the large audience assembled in the unoccupied portion of the turbine room, M. S. Sloan, president of the company, referred to the interest which the public should have in utility development, his company's anticipation of local needs, its ambition to achieve economy and reliability in the superlative degree, and the success that has been attained in this new station, which uses less than a pound of coal per kilowatt-hour generated.

Referring to the thirty million dollars already spent on the station and the fifty or sixty million dollars total the spending of which will be necessary to complete a million-horsepower plant, Mr. Sloan said:

"We are not spending these huge sums of money just for the pleasure of spending. We are not spending so we can say we have got the biggest generator in the world or a million-horsepower plant. We are putting this investment into plant and equipment which is used and will be useful in forwarding the growth of our community, building up prosperity and making easier and happier the lives of human beings.

"We are building with every consideration for efficiency and economy. We intend, if humanly possible, that each new generator installed shall be superior in performance to its predecessor. We intend to continue our policy and record of furnishing the best possible service at the lowest possible cost and of sharing the benefits so obtained with the public we serve.

"Our company is a part of Brooklyn, a permanent, vital part, sharing in and affected by everything which concerns Brooklyn. Our community will thrive and move forward in just the degree to which all of us and each of us can further progress in our individual fields by giving the best that is in us. Our company is mighty proud of its opportunities and the responsibility they place on us. We believe our course as a business which is a vital factor in Brooklyn's life has won respect and confidence. I know of nothing which is more valuable to a man or to a business. What you will see here today, and what I am trying to interpret by my words, is the evidence of our determination to do our job at all times so we can know and you can know it's a good job well done."

M. S. SLOAN

Through continued personal interest in Brooklyn's welfare Mr. Sloan has made personalities, rather than merely a corporate name, synonymous in the public's mind with electric service.

Following Mr. Sloan, William A. Prendergast, chairman of the New York State Public Service Commission, pointed to this latest accomplishment of the Brooklyn company as another great step to conserve natural resources. He also expressed pride at having the opportunity to express faith in private generation and sale of electricity under state regulation and pay tribute to its accomplishments.

Some especially noteworthy comments from the commissioner's observations are quoted:

"If the Public Service Commission of this state—and I am sure I can truly say of any other state—could have its way, it would seek the type of service and public relation which are exhibited by this company.

"In my judgment, the most significant statement made by Mr. Sloan in the address he has just delivered is that this station will use less than one pound of coal per kilowatt-hour of energy generated. One of the objects we have been working for in this country for some years is to conserve our natural resources. Many means for securing this result have been suggested, and the introduction of a larger use of our water power has been urged. But along with the general development of the electrical industry the thought and genius of its best minds have been seeking the means for saving coal, and here we have a demonstration that they have conquered this problem.

"This occasion is fraught with another great ideal of our economic and social life. This stupendous edifice and the commodities that have entered into its construction, and the vast and complicated machinery which represents its heart, as well as the purpose they are all designed to serve, typify anew a most indispensable element of our tremendous national growth, and that is the genius of private initiative and attainment. I would not for a moment deprecate or disparage what has been accomplished under public control, but I am convinced that the surest avenue to national and individual advancement is the stimulating influence of private endeavor and management as opposed to governmental control and operation. Private initiative gives the spur to

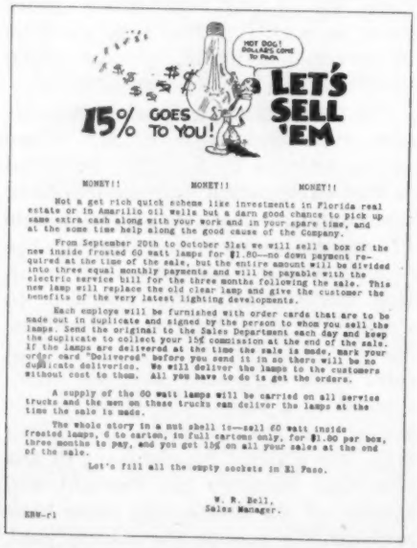
*See ELECTRICAL WORLD for Feb. 5, 1927, page 313.

individual ambitions that can be derived from no other source."

Throughout the inspection tour of the plant afforded the visitors, exceptional pains were taken to enable laymen to comprehend the nature and purpose of various equipment. The guides' explanations as well as the placarded descriptions were clear and non-technical. A turbine, a boiler, a circuit breaker and other apparatus were exhibited to expose their internal construction.

El Paso Lamp Sales Average $1.65 per Customer

WITH lamp sales averaging approximately $1.65 per domestic customer, the El Paso Electric Company closed a successful six weeks' Mazda lamp campaign in which 83


HOT DOG! DOLLARS COME TO PAPA
15% GOES TO YOU!
LET'S SELL 'EM
MONEY!!
MONEY!!
MONEY!!
Not a get rich quick scheme like investments in Florida real estate or in Amarillo oil wells but a darn good chance to pick up some extra cash along with your work and in your spare time, and at the same time help along the good cause of the Company.
From September 20th to October 31st we will sell a box of the new inside frosted 60 watt lamps for $1.80—no down payment required at the time of the sale, but the entire amount will be divided into three equal monthly payments and will be payable with the electric service bill for the three months following the sale. This new lamp will replace the old clear lamp and give the customer the benefits of the very latest lighting developments.
Each employe will be furnished with order cards that are to be made out in duplicate and signed by the person to whom you sell the lamps. Send the original to the Sales Department each day and keep the duplicate to collect your 15% commission at the end of the sale. If the lamps are delivered at the time the sale is made, mark your order card "Delivered" before you send it in so there will be no duplicate deliveries. We will deliver the lamps to the customers without cost to them. All you have to do is get the orders.
A supply of the 60 watt lamps will be carried on all service trucks and the men on these trucks can deliver the lamps at the time the sale is made.
The whole story in a nut shell is—sell 60 watt inside frosted lamps, 6 to carton, in full cartons only, for $1.80 per box, three months to pay, and you get 15% on all your sales at the end of the sale.
Let's fill all the empty sockets in El Paso.
W. R. Bell,
Sales Manager.
EBW-rl

BULLETIN TO STIMULATE EMPLOYEE INTEREST IN MAZDA LAMP CAMPAIGN

Three employees earned commissions of approximately $45 each.

employees participated and earned commissions amounting to $510. The bogy set for the campaign was 6,000 60-watt inside-frosted Mazda lamps, but the sale ended with a total of 12,276 lamps placed in El Paso homes, or an average of practically one lamp for every residential customer.

Lamps were sold only in full cartons of six for the regular price of $1.80. No down payment was required, the entire amount being divided into three equal monthly payments and billed with the customer's light bill. Every employee of the company was made a salesman and was allowed 15 per cent commission on all outside sales. Sales made on the sales floor carried a commission of 5 per cent. No advertising of any nature was done, the efforts of the employees to put over the sale being depended upon entirely. Eighty-three responded and splendid results were obtained.

To start the sale, a bulletin was issued to all employees carefully outlining the procedure to be followed, and at the close of each week a bulletin tabulating the results was sent out showing department standings and the standing of the five highest men in the company. Interest was stimulated by contests started in the different departments, and prizes were awarded to the high man for the week.

The head of one of the departments offered a hunting trip as a prize for the campaign; this was won by a Mexican truck driver in the line department. It is interesting to note that the high men in the campaign were not in the sales department. The three high men were:

Meter installer, 172 cartons; collector, 168 cartons, and power-plant oiler, 165 cartons.

Winter Refrigeration Campaign

Missouri Company Gets Sales Activity Under Way to Take Advantage of Early Deliveries—Close Co-operation Among Manufacturer, Wholesaler and Central Station

BY H. C. PORTER
New-Business Manager
St. Joseph Railway, Light, Heat & Power Company

AN ELECTRIC refrigerator campaign is being conducted during this month (February) by the St. Joseph Railway, Light, Heat and Power Company in St. Joseph, Mo., a city having a population of about 85,000. Fourteen salesmen are used, who are members of the general sales force; they will perform their parts in the campaign in conjunction with their ordinary sales duties. No district assignments will be made; any man may make a sale in any part of the city. House-to-house canvassing will be employed. In addition to the salary plus 10 per cent sales commission, the salesmen will receive extra reward during the campaign in the forms of prizes of cash, merchandise and a convention trip.

Outline of Campaign Plan

Commission.—Ten per cent on all sales closed. Commission based on factory list price of units installed.

Prizes.—M-5-2 Frigidaire to salesman selling or turning in prospects that result in largest number of units sold. Trip to national convention at Dayton in April to salesman selling or turning in prospects that result in second largest number of units sold; $75 to salesman selling or turning in prospects that result in the third largest number of units sold; $50 to salesman selling or turning in prospects that result in the fourth largest number of units sold; $25 to salesman selling or turning in prospects that result in the fifth largest number of units sold.

Seventy-five units must be sold or it will be declared no contest and no prizes will be given. However, if prizes are given, the R. E. Parsons Electric Company will pay one-half of the purchase price of the M-5-2, as well as one-half of the cash prizes. As regards the trip to Dayton, that is to be borne jointly by the Frigidaire Corporation, the R. E. Parsons Electric Company and the dealer, each standing one-third of the expense.

Advertising Expense.—Credit from Frigidaire Corporation (one-third) during campaign. In addition to the factory rebate the R. E. Parsons Electric Company will absorb the regular three-fourths of 1 per cent charged to advertising on all units sold during the campaign.

Additional Campaign Help.—For three mornings previous to the start of the campaign the R. E. Parsons Electric Company will have at least one man present at sales meeting to give an instructive "pep" talk relative to this campaign. Also, the public utility division will have one man present at these meetings. Further, the R. E. Parsons Electric Company will furnish free the services of one installation man for the entire duration of this campaign providing 75 units are sold. Should the dealer fail to sell 75 units, the salary and expenses of this installation man shall be divided evenly between the dealer and the R. E. Parsons Electric Company.

Selling Price.—Cash prices on all units to be regular factory list plus installation and delivery charges; add 8 per cent per annum for two years' time. If customer makes cash payment of 10 per cent or more of total bill, same should be deducted before interest charges are made.

Purpose.—(1) To educate and sell our customers the advantages and economy of electrical refrigeration over the old method of melting ice. (2) To establish a world record for a 30-day campaign, so St. Joseph can secure national publicity through trade papers and publications.

Proposition.—(1) Free-trial demonstration without obligation to buy.

(2) Minimum time for customer to make first payment May 10, 1927. (3) One-twenty-fourth of total bill to be minimum first payment, or total bill divided into 24 equal monthly installations. (4) Special winter and early spring offer, so customer can get delivery with better service than would be possible during spring and summer rush.

Operation.—The operation of the campaign will depend largely on personal solicitations, and every salesman must do his part if St. Joseph is to establish a record. All new-business salesmen will participate and have an equal chance to win prizes. Each salesman has accepted a quota and will be held responsible to secure enough prospects from which the quota can be sold. The factory will furnish two high-grade salesmen and the R. E. Parsons Electric Company will furnish one during the entire time that the campaign is in progress to assist in closing sales.

Advertising.—Newspaper copy will be prepared by the Frigidaire Corporation and outlines similar to other campaigns in the Doherty properties. Newspaper ads should be strengthened by the use of direct mail to a selected list of prospects, painted banners placed on all cars and trucks, handbills or any other form of advertisement that will help get the advantages of the electrical refrigeration forcefully before all electric customers. Two per cent of total sales, based on the quota, should be spent for advertising and careful thought given each expenditure in order to determine whether same is justified.

Quota.—The quota for the campaign is set for 100 Frigidaire units. The salesmen's individual quotas should be set by the new-business manager based on their sales records.

Radio Trades Body Handles Radio Complaints

A PLAN for investigating radio interference complaints through a joint committee representing radio and power company interests is being given a three months' trial in San Francisco and so far is working out very successfully. The expense of the three months' trial of the plan is being borne jointly by the power companies and the association.

Newspaper publicity has diverted nearly all complaints to radio dealers and to the committee.

Dealers and the committee through the latter's expert first investigate the complaint and the company responsible for the noise is not notified until after the interference has been definitely traced to its equipment. During December, the first month of the trial, 22 complaints were received and in the majority of cases were investigated the day received or the day following. An average of seven and one-half hours' time was required for each complaint. In only two cases was the trouble traced to power lines. The disturbances were due to a variety of causes, including near-by electrical construction work, violet ray and X-ray machines, defective ignition systems on oil burners, elevator and oil-burner motors, doorbells and trolley lines and street cars.

The only objectionable feature to the plan that has so far developed is that some dealers who receive complaints take advantage of the call to sell the party new tubes, batteries and other accessories. This, however, can be overcome by educating radio listeners to enter their complaints with the Radio Trades Association. Later the plan may be extended to near-by communities.

Illuminated Christmas Trees Attract Trade

ELECTRICALLY illuminated Christmas trees used on downtown streets are of comparatively recent adoption. This lighting not only produced the desired decorative effects for the merchants of Omaha, Neb., but undoubtedly encouraged shoppers to extend their trading well into the evening hours.

The Associated Retailers of Omaha sponsored this plan and sold the idea to the members. Two hundred and five 10-ft. trees, set at regular intervals along the curb of the sidewalk in the business district, supplied with eighteen 10-watt lamps each, were lighted every evening from Dec. 4 to Dec. 29, from darkness until midnight. So great was the satisfaction expressed by every one concerned in this venture that plans are already under way for an even more extensive use of these illuminated trees for Christmas, 1927.

ELECTRICALLY LIGHTED CHRISTMAS TREES BRIGHTEN OMAHA BUSINESS DISTRICT

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

High-Pressure Steam for Marine Use.—O. H. HARTMANN.—In this paper, which was presented by the author at the recent annual meeting of the Schiffbautechnische Gesellschaft, a general review of the present position of high-pressure steam practice is given. The early part of the paper is devoted to a consideration of the gain to be obtained by raising initial steam pressures and temperatures and re-superheating. In the remaining part of the paper the author deals with high-pressure boilers, and several drawings are given for marine-type boilers designed for a working pressure up to 65 atmospheres or 940 gage and having a steaming capacity of about 20,000 lb. to 25,000 lb. per hour. It is demonstrated that the weight of such boilers is in no way excessive and that the cost should not be higher but rather lower than that of ordinary superheated steam or water-tube boilers. The author expressed the opinion that turbines will always be used for large powers, but pending the development of a reliable high-pressure turbine, a reciprocating engine of the type described can, he says, effectively be employed for marine service, even if the lower ranges of expansion are arranged to take place in a low-pressure turbine.—*Engineer (England)*, Dec. 10, 1926.

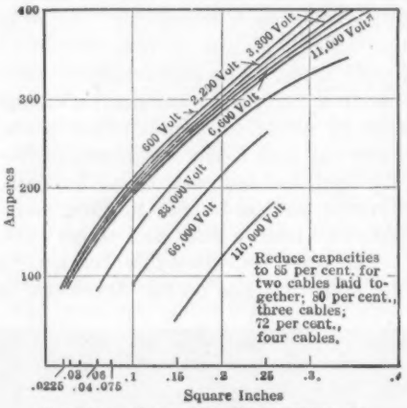
Generation, Control, Switching and Protection

Relay Protection of Large Generators.—ROBERT POHL.—Passing over the details of numerous complicated devices which aim to protect the generator against all possible kinds of failure but involve extraordinarily complicated connections and numerous relays, the author proceeds to analyze the kind of faults from which protection is essential and to show with what minimum of relays and auxiliary devices this protection can be obtained. For the stator he lists (1) earth faults, (2) short-circuit between phases, (3) short circuit between turns; for the rotor, (1) earth faults, (2) short-circuit between turns. In considering possible stator faults he makes a distinction between machines with bar and those with coil windings. A reliable relay protection against earths and against flashovers between points in the end windings is all the author considers necessary. Discussion is provided in detail concerning the proper type of protective equipment to place upon generators.—*A.E.G. Progress*, December, 1926.

Transmission, Substations and Distribution

Enameled Wires.—E. GOLDBACHER.—In the laboratories of a large Austrian concern extensive tests were made on enameled copper wires, because it was found that the same size of enameled wire bought from different manufacturers showed widely differing electric qualities. It was found that the metallurgical nature of the copper and the mechanical condition of its surface determine, to a large extent, the quality of the finished enameled wire. Not until local wire mills observed certain rules of annealing, rolling and drawing of the bare copper wires could the finished product compete with imported wires. Results from mercury-bath tests and micro-photographs of cross sections and length sections of the wires helped materially to remedy the initial failures. Detailed data are given on rolling and drawing wires, on the most suitable lacquer and, in particular, on numerous types of enameling furnaces. Electric heating of such furnaces is, it is claimed, the only fully reliable method to achieve uniformly good results.—*Elektrotechnische Zeitschrift*, Dec. 9, 1926.

Design of Extra-High-Pressure Cables.—E. B. NIXON.—This article gives views upon what has long been a matter of importance to all potential purchasers and manufacturers of super-pressure cables—authentic carrying capacities. The article consists of



CURRENT CARRYING CAPACITIES OF THREE-CORE CABLES

a series of curves, one group indicating the current-carrying capacities of armored cables laid direct in the ground and another group giving the suggested carrying capacities for varnished-cambric-insulated and lead-covered cables for internal power-station use.—*Electrical Review (England)*, Jan. 7, 1927.

Units, Measurements and Instruments

Magnetic Testing.—In order to promote uniformity in specifications and testing of magnetic materials, this circular gives a brief discussion of magnetic quantities and characteristics of material and outlines various methods used by the Bureau of Standards for magnetic testing.—*Circular of Bureau of Standards No. 17.*

Air-Gap Magnetic Field in Non-Salient Pole Machinery.—G. B. HAGUE.—In Part I of this article, previously abstracted, the author investigated the magnetic field set up by a single straight wire in the annular air gap between concentric cylinders of highly permeable iron. In this concluding installment the fields of a current sheet, of a single coil and of a group of coils were investigated. The final section deals with a dynamical action between wires, coils and coil groups.—*World Power*, December, 1926.

Illumination

Intensity of Light and Speed of Vision Studied with Special Reference to Industrial Situation.—C. E. FERREE and G. RAND.—The chief purpose of the investigation was to study the effect of change of intensity of light over a wide range on the speed of vision in the presence of these two variables. The visual angles selected were considered representative of sizes of work for which changes of the intensity of light have an important ocular effect. The range of illuminations covered extended from 1.25 ft.-candles to 100 ft.-candles. The determinations were made with the special purpose of obtaining information on the following points: (1) the comparative importance in changes of size of objects, difference in coefficient of reflection between object and background, and intensity of illumination, as factors influencing the speed of the eye's response; (2) the influence of size of object and the difference of coefficient of reflection between object and background on the range of speeds given by the illuminations selected; (3) the influence of both of these factors on the shape, sharpness of inflection and location of the knee of the curve representing the change in the speed of the eye's response. Other points of special consideration have been the comparative benefit of increase of illumination at various points in the intensity scale, the relation of size of pupil to the intensity of light and speed of vision and a comparison of the more important features of the curve representing changes of speed of vision with change of intensity of light for a pupil of constant and of variable size. The experiments described in this paper introduce a program of study on the effects of changes of intensity of light which has been planned in connection with the work of the National Research Council's committee on industrial lighting.—*Transactions of Illuminating Engineers Society*, January, 1927.

Motors and Control

Poly-Cascading of Induction Motors—V. KASSJANOFF.—Connection of two asynchronous three-phase machines in cascade has been the subject of a great many theoretical and practical investigations, but no attention has so far been paid to extending this connection to three and more units. In spite of certain disadvantages which are inherent in such arrangements, sufficient merits may be found in this method, particularly with respect to electric traction, to warrant further investigation. The great range of economic speeds is the most tempting feature of multi-cascaded motors. A set of three induction motors gives theoretically 62 speeds, four motors 312 speeds. Most of these are of academic interest only, because of either a too low power factor or a too excessive speed, but a very considerable number of speeds fall well

within a useful range. The author develops the theory of this problem and describes tests made with three motors in triple cascade connection. The particular type of the three test motors gave 32 possible speeds, of which 21 lay within 527 and 2,000 r.p.m.—*Elektrotechnik und Maschinenbau*, Dec. 5, 1926.

Heat Applications and Material Handling

Annealing Iron and Steel in Electric Furnaces.—J. S. KEENAN.—Two fundamental requisites for the annealing of steel in the form of wire, sheets, forgings and castings as given by the author are uniform temperature within the furnace and accurate, positive control of the heat. The article provides an analysis of the temperatures necessary in the annealing of certain types of castings and cites several manufacturers' experiences with the use of electric furnaces for improving the control and quality of their product.—*Electrical News* (*Canada*), Jan. 15, 1927.

Alloying Units for Gray-Iron Plants.—H. P. PARROCK.—As expressed by the author, it is his intention in this article to suggest that research is the duty of the ironmaker, the one agent capable of collecting data, correlating facts, advancing theories and testing conclusions for the advancement of the gray-iron foundry business. He further suggests the equipment and method of procedure by which a reasonable return may be had on the investment under ordinary conditions of practice. The intention is to present a practical method of improving the gray-iron foundry trade by increasing the range of useful iron by the use of alloys, while at the same time the ironmaker is to be afforded a means of protecting himself against loss in time, money and often reputation arising from "off-iron" and, further, is to enjoy an evident widening of the iron market. As this proposed plan is developed, it is expected that an appreciable curtailment may be reached in the grades of ore for mixing purposes, with consequent reduction in investment and better regulation of practice. What the author proposes is the use of an open-hearth furnace of suitable size and type, conveniently placed to take hot metal, with a small complementary electric furnace for melting alloys. This metal and alloying unit would constitute an intermediary step between the blast furnace and the pig machine for only that part of the furnace output which can be alloyed to advantage, or which can be corrected for silica, phosphorus, manganese and possibly carbon. Briefly, the advantages to the ironmaker of an auxiliary unit such as that described in this article would appear to be: (a) A wider market for iron arising from the use of alloys; (b) reduction or elimination of "off-iron," with consequent ability to market special iron-high manganese; (c) steady furnace practice due to elimination of special ores, with consequent decrease in inventories; (d) a more even market, arising from a more diversified product easily obtained; (e) leadership, prestige and progress. In conclusion, the author urges study, research, development of the known facts by the ironmaker and closer cooperation between furnace and foundry.—*Iron Age*, Jan. 20, 1927.

Hardening of Iron Wires.—H. ALTPETER.—This article is a discussion of the German practice in heating, quenching and tempering of wires. For both cast-iron and steel wires the finishing processes comprise annealing, tempering, lacquering, coating with metals, galvanizing, tinning, coppering and, lastly, polishing. The annealing of steel wire proceeds as in the case of cast-iron wire; particular care is necessary in cooling and removing the wire from the heating chamber. Respecting the changes of physical properties that come with the drawing of steel wire, such as elasticity, electrical conductivity, magnetic susceptibility and so on, reference is directed to the work of Goerens, Seyrisch and others.—*Wire and Wire Products*, January, 1927.

Traction

A Railway Electrification Scheme.—This article discusses the working of some of the apparatus which is being used in connection with the electrification of the Cape Town Suburban Railway. The scheme provides for the electrification of the track from Cape Town to Simonstown, a distance of about 30 miles, and is believed to be unique in that it is the first occasion on which the equipment for supplying an entire railway line has been automatically operated and remotely controlled. The power is to be supplied from the Salt River power station, Cape Town, and transmitted by both overhead and underground cables on a 33,000-volt and 12,000-volt, three-phase, 50-cycle system to six substations along the track, all of which will be subjected to supervisory control from the generating station. The track will be supplied with direct current at 1,500 volts.—*Electrical Review* (*England*), Jan. 7, 1927.

Telegraphy, Telephony, Radio and Signals

A New Radiogoniometer.—R. A. WATSON WATT and J. F. HERD.—The defects and limitations of radio-telegraphic direction finders in use are generally realized. The ideal radiogoniometer would record the true azimuth of arrival of any desired signal; at the same time, it should record at least one fundamental parameter determined by peak-field strength or one of its derivatives. The indications should be independent of the presence of simultaneously incident signals of any form or distribution. This paper describes a device which is a much closer approximation, according to the authors, to the ideal than its predecessors. In this article the connections for the apparatus are illustrated, and it is shown that accuracies of one degree can be obtained on any one deflection exceeding half scale. Two special features are the precautions taken to insure symmetry and the large areas of loop used. Reference is also made to the utility of the apparatus in the study of bad atmospherics. The sum of these special properties has an important relation to the question of the navigational radiotelegraphic beacon. The difficulty is the provision of a network of beacons without undue interference with other radio-telegraphic traffic. With the cathode-ray direction finder adopted as the standard instrument for operation of beacons, continuous-wave transmitters with a frequency that need only be a fraction of a cycle per second might become practicable for adoption.—*Electrician* (*England*), Dec. 31, 1926.

Radio-Telegraph Recorder.—A. JIPP.—Receiving Morse code over the radio is commonly done with earphones. This limits the sending speed to the listening skill of the receiving operator or, if a record is desired, to the speed with which the operator is able to write. A German concern has recently perfected a mechanical recorder, similar to the siphon recorder of transoceanic telegraphy, which not only assures positive reception but is to a very high degree unaffected by atmospheric interference. The instrument is essentially a moving-coil galvanometer, the coil being suspended between two short lengths of steel wire. At the end of the horizontal writing lever is fastened a fine silver tube, one end of which touches lightly the recording tape while its other end moves in a drop of recording ink. This drop is maintained by a simple but ingenious feeding mechanism. Up to 2,000 letters a minute can be recorded with certainty.—*Siemens Zeitschrift*, December, 1926.

Miscellaneous

Equipments for Air Ports.—M. SAUERNHEIMER.—The article describes the technical features of the recently finished air port of Berlin, which covers an area of 380 acres. Of particular interest are the various uses of electric power. A three-phase, 6,000-volt cable furnishes energy from the Berlin city supply and feeds two transformers of 160 kva. and 50 kva. with a 220-volt secondary. In the fuel-supply house are installed six large motor-driven gasoline pumps, each of which can fill a 300-gal. airplane gas tank within four minutes. A 500-cycle generator provides high-frequency current for the radio-telegraph office, equipped with 2-kw. tube senders. A motor-driven siren on the roof of the observation tower is used to sound far-reaching acoustical signals. A large part of the landing area is illuminated at night by seven cluster lights, each with five 1,000-watt lamps. On the tops of two of the antenna towers are installed huge neon-light flashers, each consisting of twelve glass tubes one yard long. These special flares require 3,600-volt operating potential, for which a special transformer has been provided. In the low-voltage winding of this transformer is placed a motor-driven interrupter, which causes the flares to code the Morse letter "B" in regular intervals. The two neon lights give about 3,600 cp. each in orange light. During foggy weather a 250,000,000 cp. arc searchlamp can throw a light beam in any direction that may be desired to meet an emergency.—*Zeitschrift des Vereines Deutscher Ingenieure*, Nov. 13, 1926.

New Books

Guiding Principles of Public Service Regulation

Vol. III. By Henry C. Spurr. Rochester, N. Y.: Public Utilities Reports, Inc. 919 pages.

The two important topics of rate making and the returns to which utilities are entitled are treated in this volume. Commission and court cases afford a legal background for a complete treatment of the subjects and the author has executed his task in an excellent manner. Rates for electric light and power, railways, telephones, water and gas are all discussed and the effects of contract or franchise rate clauses are explained.

This book is a running digest of authoritative decisions. Any student of rates and any executive or financier interested in allowable rates of return in the utility business will find it invaluable. It is up to date and complete and can be used in practice at this time to very good effect. The treatment of such topics as efficiency in management, grade of service, the necessity to attract capital and returns during abnormal periods is especially interesting and valuable.

Engineering Problems

By William G. Raymond, Sherman M. Woodward and Irving H. Prageman. New York: McGraw-Hill Book Company, Inc. 47 pages, illustrated.

This book of problems does not undertake to confine itself to any particular, definite field of engineering subject matter. On the contrary, the authors express as their intention "to review some of the most important and useful fundamental facts of elementary mathematics and physics; to illustrate and cultivate the application of the principles of these sciences to elementary, common-sense, every-day problems illustrative of work comprehended in actual engineering, . . . and, lastly, to illustrate by a few examples the engineer's usual method of attack upon practical problems."

Electrical Insulating Materials

By Allan Monkhouse. London, England: Sir Isaac Pitman & Sons, Ltd. 386 pages, illustrated.

This book is a treatise on the preparation, properties and characteristics of the materials used for electrical insulation and contains also a description of methods of testing. Classes of insulating materials and a general theory of insulation introduce chapters on specific topics. Insulating papers, fabrics, tapes and binders, cable insulation and covering for wires, varnishes and solvents, pressboard, fiber, varnished paper, bitumens and filling compounds, insulating oils, molded compositions, mica and mica products, cellulose products, asbestos, ceramics, slate and marble, cements and oxide films are chapter topics which give an idea of the very broad scope which the book covers.

While not deeply scientific in treatment, the book provides available data, test methods and a good discussion of the materials and their use. It should be welcome to engineers and manufacturers interested in insulation of any kind. The test methods are well illustrated and explained and conform to English standards.

Water Power Engineering

By H. K. Barrows. New York: McGraw-Hill Book Company, Inc. 734 pages, illustrated.

Professor Barrows has written a very sound and complete book on the principles and practices followed in developing water powers. Good engineering principles, authoritative quantitative data and formulas, an economic perspective and a judicious use of sound reasoning have gone into the presentation of the subject. Chapters on hydrology, steam-flow data and water-power estimates, turbines and plant design, dam design and construction, canals and penstocks, power-house equipment and construction, plant accessories, speed and pressure regulation, transmission lines, costs and values, reports and plant descriptions are indicative of the scope of the work.

The hydraulic features of the book are most complete and detailed. New England plants were drawn upon very largely for material, but representative water-power developments in other sections are described and discussed. Dams and dam construction are well treated in general, but no attempt has been made to go into detailed design of special dams such as the multiple-arch type. The electrical features of the book are not so detailed and complete as are the hydraulic. Rather elementary descriptive matter is included for equipment, and data on electrical apparatus and designs are rather meager. There is an excellent treatment of speed and pressure regulation for hydraulic units, and this chapter is a notable and useful contribution.

Transmission is treated as a fundamental electrical circuit problem, and no attempt has been made to go into its network or stability aspects, though many valuable structural design data on lines are included. The author gives a sound discussion of water-power development and transmission in competition with steam power. With special exceptions for New England, he makes the statement that, "excluding water power, no extensive interconnection will take place between load centers under present conditions of increasing economy in steam-plant design, where the adjoining load centers are equally favorably situated with regard to coal supply and condensing water." He treats of long-distance power transmission on both a service and an economic basis and gives cost discussions which should clarify the situation and remove many misconceptions. The book is well written and well illustrated and is a welcome addition to the literature of the subject.

Vacuum Practice

By L. Dunoyer, translated by J. H. Smith. New York: D. Van Nostrand Company. 227 pages, illustrated.

All experimental workers who have tried to produce, maintain or measure high vacua will welcome this book. It was written from lectures given to aid practical research workers. It covers pumps, manometers, elimination and analysis of gases and the production and improvement of vacua by use of absorbers or by electric discharges. Some of the material is based on the good work of Dushman and Langmuir in this country, but the author also has made fine contributions to vacuum technique. The blend of theory and practice is admirable, and the research worker will find here valuable and interesting information on the subject matter.

Photometry

By F. G. H. Lewis. New York: D. Van Nostrand Company. 500 pages, illustrated.

This book covers the practical and theoretical aspects of measuring light flux, candlepower and illumination. It is a very thorough and complete exposition of modern photometry and contains at the end of each chapter a splendid bibliography. Radiation, the eye and vision, standards of candlepower, measurement of candlepower, heterochromatic and spectro photometry, measurement of color, physical photometry, illumination photometry, measurement of brightness and reflection, photometry of projection apparatus, stellar photometry and the photometric laboratory are some of the topics which are treated in a thorough manner.

Book Note

Political and Industrial Democracy, 1776-1926. By W. Jett Lauck. New York: Funk & Wagnalls Company. 374 pages.

A sympathetic examination of employee representation in the councils of industrial companies forms a large part of this book, written by a former professor of economics and politics at Washington and Lee University. It touches also on industrial conferences the changed attitude of labor, collective bargaining, profit sharing, stock acquisition and many other things that have sprung from the mutual reactions of employers and employed. Class consciousness and conflict in America, the author holds, can be eliminated by the removal of the autocratic features of capitalism, a process which will not impair but increase its efficiency. The book is packed with facts concerning recent developments in the United States along the lines it advocates, the Ford, the Filene and the Mitten plans being among the many cited.

Books Received

Applied X-Rays. By George L. Clark. New York: McGraw-Hill Book Company, Inc. 255 pages, illustrated. Price, $4.

High-Tension Line Practice. By Ernest V. Pannell. New York: D. Van Nostrand Company. 322 pages, illustrated. Price, $5.

Mundy's Earning Power of Railroads. 1926. Compiled and edited by Floyd D. Mundy. New York: James H. Oliphant & Company. 535 pages.

Electric Power Stations. By L. W. W. Morrow. New York: McGraw-Hill Book Company, Inc. 326 pages, illustrated. Price, $4.

Mechanical World Year Book, 1927. Manchester, England: Emmott & Company, Ltd. 170 pages. Price, 1s. 6d.

Caravans of Commerce. By Isaac F. Marcosson. New York: Harper & Brothers. 332 pages, frontispiece.

News of the Industry

THOMAS A. EDISON, IN 1926—LAUREL-CROWNED, BUT ACTIVE STILL; IN 1896—AT THE HEIGHT OF HIS FAME, AND IN 1876—AT THE START OF HIS CAREER

Electrical Industry Salutes Eighty-Year-Old Chief

UNIVERSAL acclaim went up yesterday, Feb. 11, from the electrical industry, not only in America but all over the world, for Thomas A. Edison, who on that day completed his eightieth year. The great inventor announced that he would celebrate the day in his usual fashion by staying home, though he consented to give a "birthday interview" to newspaper men who called on him at his residence, Llewellyn Park, Orange, N. J. He also promised to attend the annual luncheon at Newark of the Edison Pioneers, of whom George F. Morrison, vice-president General Electric Company, is now president. Four score found Mr. Edison in good health and still hard at work fifty years after he first attained fame.

Announcement was made that Henry Ford would be Edison's guest on his birthday. On Tuesday, Feb. 8, John W. Lieb broadcast an address on the inventor from the New York Edison Company's station, WRNY.

Denver Franchise Carries

Vote of People Two and a Half to One in Its Favor—How the Fight Was Carried Through

BY A MAJORITY of two and a half to one the city of Denver on Tuesday, Feb. 8, indorsed the new franchise for the Public Service Company of Colorado. The vote stood 19,354 to 7,693. Its provisions were printed in the ELECTRICAL WORLD for Dec. 18 (page 1285). The franchise contained a schedule of rates drawn up by Ray Palmer, consulting engineer of New York City. It will run for 20 years.

A lively campaign was waged for months before the election, newspapers, civic bodies and electrical associations all taking part. Both the Public Service Company of Colorado and the Anti-Franchise League inserted five-column advertisements in the Denver *Post* for and against the franchise. The company listed nearly twenty civic associations in its favor, including the Chamber of Commerce, and said that none opposed it. The *Post* gave a judicially balanced support to the proposal, on the ground that it meant an annual saving of about $700,000 to consumers, that to reject it would bring litigation, and that the opposition was inspired by men interested in making money through the hydro-electric scheme which the Mayor and City Attorney had refused to make part of the franchise. The *Evening News* was pronounced in favor of the plan, saying: "The proposed franchise has been combed for flaws and no important objection has been found. This is not the hour to be quibbling over B.t.u.'s. All things considered, it would be to the advantage of Denver to grant the franchise, reduce rates and let the company go ahead with its betterment plans."

Institute Holds Profitable Winter Meeting

President Chesney Emphasizes the A.I.E.E.'s Part in Standardization —Admirable Technical Program Carried Through with Much Earnest Discussion

MUCH earnest discussion followed the presentation of the many technical papers that made up the program for the winter meeting at New York this week of the American Institute of Electrical Engineers. This program was printed in full in the ELECTRICAL WORLD for Jan. 22 (page 216), and abstracts of the papers and discussions will be printed in the issue for Feb. 19. Voltage standardization was the outstanding topic, the papers on cables and circuit breakers ranking next as concerns interest aroused. The sessions were well attended, and the dinner-dance of Wednesday evening attracted 750 attendants. Dr. Coolidge's declination of the Edison medal, explained on Jan. 29 (page 263), forced the omission of the features that were to mark its presentation.

When the convention first assembled on Monday afternoon, E. B. Meyer, as temporary chairman, introduced the president of the Institute, Cummings C. Chesney, who in his address devoted himself to standardization, emphasizing the great need that the preparation of standards be pushed by the Institute. He declared that the prestige of the A.I.E.E., acquired through 28 years, should not be dissipated by relegating to trade associations the making of standards for the industry. If the recent Institute report is sound, Mr. Chesney said, then the policies therein indorsed should be followed. The Institute, he thought, should put more vigor into activities of this nature. Otherwise it would have to leave such work to associated interests with restricted points of view.

An animated discussion of President Chesney's address was participated in by J. M. Bryant, who argued that it would be a mistake to permit a division of the standardization work, particularly among the manufacturers; Prof.

C. F. Scott, who suggested that a program of co-ordination of all interests be followed out; W. H. Colburn, who discussed the situation existing in eastern Massachusetts on this matter, which, he said, threatened chaos, and who called for the Institute to exercise authority; C. O. Mailloux, who said that this work should be a collateral activity, in co-operation with manufacturers and trade associations, and yet retain definite representation of the Institute; C. E. Skinner, who, as chairman of the American Engineering Standards Committee, explained the apparent attitude of the trade associations in their desire to have an official part in making standards, and Farley Osgood, who said that the Institute must abandon its idea of pure science, that the other associations must be won over and that standards for applied science must be made. Mr. Chesney, in closing the discussion, outlined his plan in further detail, mentioning that it was contemplated that standards prepared by any body of authority outside of the Institute should be submitted to its standards committee and reviewed in a judicial manner. The A.E.S.C., he pointed out, is not a standards-making body. It can only see that procedure in making a standard is correct and cannot act as sponsor.

Load Building the Object

Methods of Accomplishing This End Provide Keynote for Portland Commercial Meeting.

PERHAPS the most important thing to come out of the meeting of the Commercial Section of the Northwest Electric Light and Power Association held in Portland, Ore., Feb. 7 and 8, was the expression of a strong tendency on the part of central-station commercial managers to adopt that policy and plan of merchandising which will place the greatest number of appliances on the lines of the power company, whether this be an active and aggressive merchandising policy or involves simply assistance to other retail outlets. It was forcibly brought out that the central-station companies' one principal objective is to build load, and there is a strong disposition to permit other outlets to sell certain appliances, particularly referigerators, where dealers have shown by results that they are able to fulfill the task to the satisfaction of the light and power company.

Discussion of domestic electric refrigeration brought out several important points. Chief among these was the fact that central-station enthusiasm is waning from the peak reached in 1925, principally owing to the fact that revenue has not been commensurate with servicing costs and manufacturers have failed to give the central stations proper assistance. Fortunately, however, manufacturers are now taking cognizance of the problem of giving service. However, the majority of those who discussed the subject felt that the central-station company ultimately must assume the task and make a charge for the service.

Following the report of the wiring committee, fear was expressed by some that the several national campaigns for raising the standard of wiring in the home will raise the standard to the point where the cost of wiring will be so great that the number of convenience outlets installed will be reduced rather than increased.

The report of the merchandising committee and the discussion which followed showed that a continuous or year-around selling plan is favored as against a few campaigns after which interest drags for the rest of the year. The results of a post card survey in Spokane were presented by Lewis A. Lewis. They definitely established the fact that consumption of energy in the home is proportional to the number of appliances in use.

At the conclusion of the two-day meeting Chairman Sawyer presented a plan which was adopted for the reorganization of the Commercial Section of the Northwest association into three bureaus, with chairmen and vice-chairmen, so that greater continuity in the work can be brought about by moving up the vice-chairmen annually.

Hoover and Mead Urgent on Boulder Canyon Dam

Herbert Hoover, Secretary of Commerce, has issued a public statement on the Boulder Canyon Dam project in which he says:

"The legislation is unique in that it imposes no burden on the federal government except the loan of the necessary credit. No work is to be undertaken until the contracts and guarantees, which amply cover the return of all funds, have been entered into. No such proposal has ever been put up from the West before, and in itself it indicates the anxiety of the Southwest; for usually the federal government has provided at least flood control at national expense.

"The form of legislative proposals is never perfect at the start. It can never entirely suit every interest. There must be some bending in compromise if we are to get forward in any subject, and I cannot but feel that the major issues are being overlooked in the apprehension over secondary questions by the sister states in the Colorado basin."

Owing to the growing menace of floods, the Imperial and Yuma Valleys in California and Arizona are threatened by a "disaster of dramatic proportions," according to information conveyed to the House committee on irrigation and reclamation by Dr. Elwood Mead, head of the Bureau of Reclamation of the Department of the Interior, who declared that the early construction of the Boulder Canyon Dam was the one thing that would minimize the danger of floods on the Colorado, with vast potential damage in the valleys. Dr. Mead took the position that if the states immediately concerned do not see fit to ratify the Colorado River compact, "it is entirely within the power of Congress to provide for the protection of the upper states by subjecting development to the terms of the compact, in so far as it gives to those states the prior right to 7,500,000,000 acre-ft. of water each year."

Boulder Dam Fight Rages

But Hope for Legislation on Muscle Shoals Has Been Virtually Abandoned on Capitol Hill

DEBATE over the Swing-Johnson Boulder Dam bill occupied the House of Representatives on Saturday last, Mr. Leatherwood of Utah ranging himself with Mr. Hayden of Arizona in threatening litigation on the part of his state should the bill become law. Chairman Smith of the irrigation committee, which reported the bill, predicted that within the near future the rules committee would give to the bill legislative right-of-way and thereby insure a vote by the House before Congress adjourns. Mr. Smith said he would accept, if the bill came up in the House, an amendment by Representative Colton of Utah to place power development under the terms of the contract.

On Tuesday Representatives Winter of Wyoming and Lea of California declared emphatically that the construction of the dam should not be delayed, and Chairman Smith announced privately that he had undertaken a personal solicitation of rules committee members to obtain preferred status for the measure.

Hopes for final action on Muscle Shoals legislation at this session virtually have been abandoned by Senate managers of three pending measures. Senator Norris, leader of the government operation group; Senator Deneen, sponsor of the associated power companies' bid, and Senator Heflin, who favors the American Cyanamid Company's proposal, have been unable to agree on any plan for a vote.

As this is written, the military affairs sub-committee of the House, which is considering the new Muscle Shoals offers in executive session, has not been able to reach an agreement with officials of the American Cyanamid Company. The chief stumbling block seems to be the conditions under which the properties will revert to the government in the event of failure to comply with the requirements concerning fertilizer manufacture. The demand for the distribution of power is so strong that an effort has been made to meet it. The new language understood to have been inserted, however, simply empowers the lessee to do a general utility business. There is no requirement that any portion of the surplus power be sent away from the Shoals.

Significance is attached to a bill introduced by Senator Copeland of New York designed to repeal the federal water-power act. While there is no chance for this bill to receive consideration at this session of Congress, it is regarded as an important development in that it reveals a part of the strategy of public ownership advocates.

An amendment to the water-power act which would permit the commission to hire personnel of its own, in addition to that borrowed from the War, Interior and Agricultural Departments, has been proposed by Senator Jones of Washington, the chairman of the commerce committee of the Senate, and Representative Parker of New York, the chairman of the interstate and foreign commerce committee of the House.

Michigan Engineers Confer

W. E. Wickenden Reports Only 7,000 Engineering Graduates Annually Available for Situations

EIGHT hundred Michigan engineers assembled on Feb. 3 and 4 in Detroit for an all-Michigan conference. "Our National Resources," "Engineering Research," "Engineering Education," "The Engineer and Public Health," "Traffic and Transportation" and "Commercial and Economic Development of Michigan" were the subjects treated.

Dr. W. O. Hotchkiss, president of the Michigan College of Mines, stated that half of Michigan's copper mines had suspended operations during the past year owing to competition from richer Western deposits, Western ore being surface-mined while Michigan veins require mining as deep as one mile.

A survey comprising the national engineering societies and the students and alumni of half of the 162 technical colleges of the United States and Canada, undertaken by the Society for Promotion of Engineering Education, indicates that the percentage of student failures is very high. The director of investigation, W. E. Wickenden, gave the conference figures showing that only 38 of each 100 engineering college matriculants ultimately graduate and only 28 of these graduate on scheduled time. At one school 40 of 100 graduated and 32 failed.

Freshmen were asked their conceptions of the nature of engineering work. Forty per cent gave mediocre replies and 19 per cent had little or no idea what engineering is, from which Mr. Wickenden concluded that education of the public is needed to forestall large numbers of uninterested matriculants. In electrical manufacturing companies the directing personnel is 14.9 per cent of the employees, and only one in three of these is an engineering graduate—this figure being higher than those for chemical, civil, mechanical and mining industries. These figures, Mr. Wickenden thought, hold the reply to the statement that there is an overproduction of engineering gradnuates. Moreover, while there are 45,000 positions suitable for engineers in industry, only 7,000 graduates are annually available. An investigation of members of the A.S.M.E. showed that of members 65 years of age only one in five is college-trained; of members near 30 years of age two in three are engineering graduates.

"The United States courts now recognize that a corporation cannot exist without research," said Dr. Charles L. Reese of E. I. du Pont de Nemours & Company. "The industries of the country need men trained in engineering research, but under the system of education in our universities the engineering student is turned out without research training and the industries are forced to train them in their laboratories."

Among the other speakers were John H. Hunt, chief of the electrical division, General Motors Corporation; W. R. Whitney, director of research laboratory, General Electric Company; Dean M. E. Cooley, College of Engineering and Architecture, University of Michigan; Rev. J. P. Morrissey, regent of engineering, University of Detroit, and Prof. H. C. Woods, College of Civil Engineering, Michigan State College.

The conference elected as officers: President, L. E. Ayres, Ann Arbor; vice-president, G. C. Dillman, Lansing; treasurer, H. L. Hudson, Detroit; director-at-large, G. J. Wagner, Grand Rapids.

Program for Kentucky Association's Annual Meeting

President Pack of the National Electric Light Association and President Sawyer of the National Electric Railway Association will be guests of honor at the banquet of the tenth annual meeting of the Kentucky Association of Public Utilities, to be held at Louisville on Feb. 18 and 19. Both will speak on the respective industries they represent. This banquet will be on Friday night. The program for that day's sessions includes addresses by T. B. Wilson, vice-president Louisville Gas & Electric Company; Harry Reid, president National Electric Power Company; L. S. Streng, vice-president Louisville Gas & Electric Company; Miss Helen E. Steiner of the East Central Division women's committee, N.E.L.A.; Brainard Platt of the Louisville *Courier-Journal;* F. L. Woodruff of the Southern Bell Telephone & Telegraph Company, and Dean W. M. Anderson of the University of Louisville. On Saturday Dr. E. A. White will speak on "The Power Company and Rural Electric Development," and there will also be addresses by N. W. Frank on safety, F. C. Dugan on water supply and Judge Huston Quin.

In the Legislative Mill

Conowingo Investigation Asked at Annapolis—Abolition of Indiana and Wisconsin Commissions Threatened—Savings-Bank Utility Investment Bill in New York

A BALTIMORE member of the Maryland House of Delegates, Paul Berman, is calling for the appointment of a committee to investigate the Conowingo contracts and expenditures. His resolution will, it is thought, probably be reported from the committee on rules. Mr. Berman also has fathered a bill repealing that part of the charter of the Susquehanna Power Company which prohibits bringing energy from Conowingo to Baltimore.

Five bills dealing with the Indiana Public Service Commission now are awaiting action in the State Senate. The Cann bill calls for complete abolition of the body and is the most drastic. It has been reported favorably out of committee, as has a bill of Senator Shake permitting municipal plants to put their surplus earnings in the general fund of the city. One bill yet to be introduced will broaden the commission's powers under the present organization and give it power to probe into the money expended by utilities for lawyers and lobbyists. Minority senators are preparing a bill to abolish the present commission and instead have a commission of six, three Republicans and three Democrats, named by the Governor with the approval of two-thirds of the Senate. A bill similar to the Cann bill is to be introduced in the House.

The Illinois Municipal League's home-rule bill went before the Illinois House of Representatives in Springfield last week, introduced by David McClugage of Peoria, which has been one of the leading municipalities in the home-rule fight. The bill provides that upon petition of 5 per cent of the voters, the question of a city voting itself out of control of the Illinois Commerce Commission shall be submitted to a referendum to be decided by majority vote.

A bill introduced in the Nebraska Legislature creates out of 43 counties in the southern part of the state what shall be known as Nebraska Public Utility District No. 1. The bill authorizes the construction of electric generating plants, the sale of energy and the impounding of public waters for this purpose in connection with irrigation. Rates are to be fixed by a board of directors. This is an attempt to give legal form to the development of what was originally known as the Tri-County project, which has been pronounced by engineers as a feasible method of making and distributing current in connection with a large irrigation project.

A bill introduced in the Oklahoma Legislature is aimed to levy heavier taxes against public utility companies. It provides that such companies shall file with their annual return of property for taxation a schedule of the property upon which their last applications for rate-making purposes were based and upon which the prevailing charges or rates to the public were fixed. It shall be the duty of every utility to show that such prima-facie valuation is higher than the fair cash value of the property. In case of failure so to do taxes shall be assessed on the rate-making base. Another bill provides that no water, gas or electric utility shall charge or collect a deposit for installing a meter in any building.

In the Oklahoma Legislature the customary bill for repeal of the revocable-permit law has been introduced.

A legislative proposal introduced in the Michigan Legislature is aimed to open up the books of utility holding companies to the State Utilities Commission. The bill is aimed at the telephone interests, which have been involved in a controversy with the Michigan commission. However, the amendment also may have a direct bearing on other utility companies. It has been referred to the utility committee of the State Senate.

A resolution has been presented in the Tennessee Legislature to set up a water-power commission which would visit the dam sites in the state in the interests of immediate action, the object being to vest more power in the state

government and oppose concentration in the Federal Power Commission.

Two measures directed against the present regulation and ownership of public utilities are to be introduced in the Wisconsin Legislature. One proposal would strip the commission of all power to regulate electric light and power, electric railway, gas, telephone and water services in favor of regulation by the local governments in the places where these various utilities operate. The bill would also remove all commission jurisdiction over municipally owned utilities. The other proposal, soon to be introduced, provides for the establishment of a centrally located superpower electric plant to supply electric light and power to the homes and industries of Wisconsin at cost of production. Assemblyman Reis of Madison has introduced a resolution calling for the appointment of a special joint legislative committee to investigate the water-power situation.

Assemblyman Willis H. Sargent has introduced in the New York Assembly the two measures introduced last year, with some changes, known as the "savings bank investment bills." One measure permits the investment by savings banks in the securities of certain gas and electric companies, while the other confers a similar privilege with reference to the securities of telephone companies. Assemblyman Sargent, commenting on his bills, said:

"Investment in utility bonds is now permitted in ten of the seventeen states in which there are mutual savings banks. An analysis of our bills by experts has led them to decide that our two bills are even more stringent than those of the other states. They provide investment only in first mortgage bonds of companies with established records of earnings over a number of years. It is estimated that only 10 per cent of the existing companies would qualify, with a total of about $500,000,000 in qualifying bonds."

Ex-Governor Miller Against Smith on Water Power

Governor Smith's program of water-power development in New York State by means of a Water Power Authority was attacked by former Governor Nathan L. Miller and others at a luncheon of the National Republican Club last Saturday. Mr. Miller said that the administration bill before the Legislature made "an obvious attempt to raise a political issue" in its first sentence, reading: "It is declared to be the public policy of the state to preserve inalienable the natural water-power resources of the state."

"As far as I know," said Mr. Miller, "no one has proposed to alienate the state's natural water-power resources." He criticised Governor Smith's plan as "a cross between private development and public development, with the demerits of both and without the advantages of either," and went into difficulties which he thought this plan presented—engineering, financing and political—maintaining the superiority of the act passed in his own term for insuring private development under state license and censoring the Governor for preventing the execution of that law.

Southern California Edison Wins Point in Los Angeles

Denying the right of the city of Los Angeles to use tax money for the building of a steam plant at the harbor and overruling the demurrer of the Board of Water and Power Commissioners, the Superior Court of Los Angeles County on Feb. 8 handed down a decision stating that the Southern California Edison Company has just cause for action in the case in which the company as a taxpayer seeks an injunction to prevent the building of a steam plant by the Bureau of Power and Light at the harbor. The decision overrules the argument of the Bureau of Power and Light regarding the use of tidelands because this contention did not take into account the provisions of the city charter regarding the harbor. "Complete control of this sphere of activity is vested by the charter in the Board of Harbor Commissioners," the decision states. "Any use of the power revenue funds for the construction of an electric plant for the use of the Harbor Department would be an illegal diversion of said funds to an unauthorized purpose and can be enjoined at the suit of a taxpayer."

Maine's Hydro Pot Boiling

Bills for and Against the Exportation of Power—Central Maine Company Frankly Backs One

DISCUSSION over the exportation of hydro-electric power waxes warm in Maine, and last week Senator Smith of Somerset introduced a bill providing for the creation of transmission companies to export surplus power under the regulative authority of the Public Utilities Commission. This bill, which has the backing of the Central Maine Power and other companies, provides for the issuing of permits after hearing and approval by the commission under which surplus power may be delivered to the transmission companies to be exported and sold without the state so long as such surplus exists. The bill contains a provision for submission to the voters at a referendum in September next. It is expected that the only serious opposition to the bill will arise from the group which has refused to admit the existence of surplus power within the state.

In a radio address former Governor Baxter has attacked the Insull interests, which acquired control of the Central Maine Power and other companies last year and are now understood to have acquired control of the Cumberland County Power & Light Company at Portland. Mr. Baxter assailed the Insull organization on the ground that it was seeking to dominate the business life of the state. In concluding a statement replying at length to the Baxter address, Walter S. Wyman, president of the New England Public Service Company, Augusta, Me., and head of the Insull properties in New England, said:

"The sole difference, as I apprehend it, between the bill before the Legislature which Ex-Governor Baxter approved in his Tuesday evening speech and the bill which our company is introducing is in that the so-called Carter bill does not provide for the export of waste power and our bill permits this under all the safeguards that have so far been indicated.

"Ex-Governor Baxter said Tuesday evening that there is no surplus power in Maine and never has been. I say that there is now abundant surplus power in Maine and that in every year since the Central Maine Power Company started in business much power has gone to waste. That surplus is increasing every year. All we desire is the privilege of selling this surplus under the proper safeguard as to Maine's prior interests."

Hearings on various water-power bills for and against exportation are to be held in the near future by the joint committees on public utilities, interior waters and judiciary. At the Feb. 17 meeting of the Economic Club of Portland ex-Governor Pinchot of Pennsylvania is scheduled to speak on "Giant Power," and W. S. Murray, New York, is to set forth the merits of interconnected "superpower."

Zigzag Lightning Is Really Spiral, New Camera Shows

Joseph W. Legg, an engineer with the Westinghouse Electric & Manufacturing Company, announced last week the perfection of a camera which takes 2,600 photographs a second, operating more than 150 times as fast as the ordinary motion-picture camera. With this camera he has photographed electric sparks produced artificially. While he has not taken pictures of lightning, he believes the natural electric spark has the same form. Mr. Legg's photographs show that the familiar flat and jagged appearance of an electric flash is an optical illusion and that its actual form is an intricate spiral, according to the illustrated announcement made public.

Fynn Sues Wagner Company Over Fynn-Weichsel Motor

A long-standing dispute between the Wagner Electric Corporation of St. Louis and Valere A. Fynn, consulting engineer, concerning the right of the Wagner company to manufacture and market the Fynn-Weichsel motor, came to a climax on Jan. 31, when Mr. Fynn filed suit in the United States District Court in St. Louis charging the Wagner company with infringement of patents and demanding an accounting. The amount involved depends on the number of motors sold by the company during the past three years, but the total will be large. The suit is based on four patents issued to Mr. Fynn to which the Wagner corporation claims ownership because both Fynn and Hans Weichsel, the designer, were for many years in its employ. Mr. Fynn, on the other hand, claims that he took the idea for the motor with him when he joined the Wagner organization, developed it himself and had been conducting his own business for two years before the Wagner firm began making the motors. The invention of the Fynn-Weichsel motor was announced in 1923.

Purchases and Mergers

Clarke Buys a New Jersey Company—Small Transactions Reported from a Number of States

ALL assets of the Sayreville (N. J.) Electric Light & Power Company have been acquired by Harley L. Clarke of Chicago. The power company will, it is announced, become a link in a chain of municipalities in Monmouth and Middlesex Counties supplied by the Eastern New Jersey Power Company, control of which is vested in the Clarke interests.

Another municipal electric plant in Wisconsin passed into the hands of a private company when the people of Granton voted, 108 to 58, to sell its transmission line and electric distribution system properties to the Northern States Power Company, from which it has been wholesaling current for redistribution. The plant was built by the village in 1919 at a cost of $22,000 and was bought for $11,000.

The Elizabeth (Ill.) Light & Power Company has been purchased by the Interstate Light & Power Company, which is controlled by the Northern States Power Company.

The city of White River, S. D., has voted to sell its municipal power plant to the Dakota Public Service Company of Woonsocket for $45,000. About a year ago at a special election the city voted ten to one to retain the plant. At that time the Dakota company offered $35,000 for it.

The voters of Grafton, N. D., have recalled their mayor and one alderman and thereby repudiated the sale of the municipal power plant by the City Council to the Otter Tail Power Company a few weeks ago. Opponents of the sale maintained that it should have been referred to the voters.

The New York Public Service Commission has granted the petition of the Orange & Rockland Electric Company for transfer to it of the electric distribution portion of a franchise from the town of Blooming Grove.

Merger of the Citizens' Gas & Electric Company and the Winchester Gas & Electric Company, under the name of the Consumers' Utilities Company of Staunton, Va., has been approved by the State Corporation Commission. Capital stock is from $274,400 to $574,400.

The Mayor and Councilmen of Alma, Ga., notify the citizens that they have agreed to sell the municipal electric light plant to Howard P. Morris, Jacksonville, Fla., for $15,000. If 20 per cent of the voters protest before Feb. 23, an election must be called.

Tacoma Has Another City Plant in View

With its Lake Cushman power project in successful operation, the city of Tacoma, Wash., has filed four additional applications with the State Hydraulics Office covering a two-million-dollar development on Lake Kapowsin, 35 miles southeast of the city, in Pierce County. By this new plant, to be completed in three years, according to its promoters, 805 cu. ft. of water per second will be acquired for domestic and power purposes. The project will require several diversion dams in addition to the dam for impounding the 50,000 acre-feet of water to be stored. The latter dam, to be of solid concrete construction, will have a height of 50 ft. and a length of 1,750 ft.

The first application asks an appropriation of 625 sec.-ft. from the Puyallup River, the second asks 100 sec.-ft. from Voight Creek and the third 80 sec.-ft. from Kapowsin Creek, both the latter being tributaries of the Carbon River.

Light and Power Industry Is First in Canada

In its latest survey of the power situation in Canada, the Royal Bank of Canada states that the electric light and power industry now ranks first among Canadian manufacturing industries in terms of capitalization, with an aggregate amounting to more than $700,000,000, and sixth among the industries in terms of annual gross income, the latter item amounting to well over $100,000,000 a year.

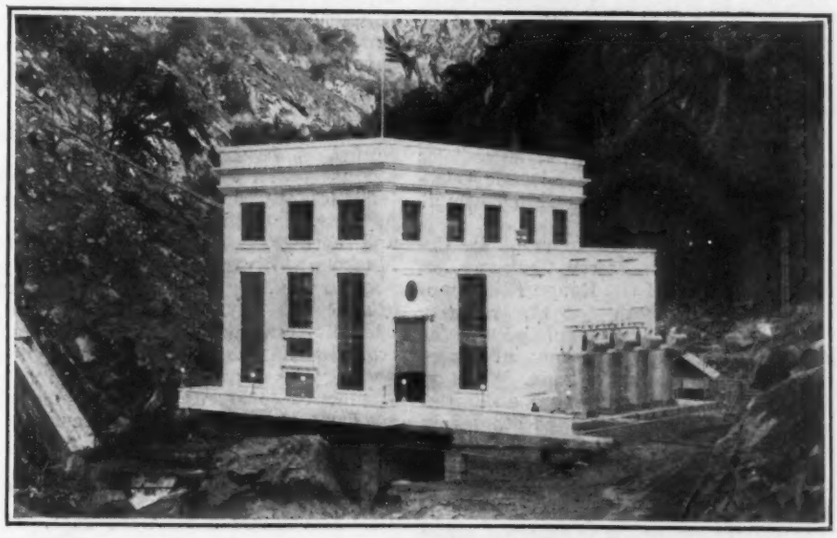
As the present installation represents the development of only 10 per cent of the recorded water-power resources and since the rate of construction of new turbines has been increasing in the past few years, there is every indication that in the immediate future the industry will witness an expansion well in line with the present trend. The Dominion Water-Power and Reclamation Service has estimated that during the next twenty years the expenditure for new installations will exceed one billion dollars. The facts that the total capacity of the turbines now installed is double the capacity of 1915 and that the recent rate of construction is much more rapid than the rate at the beginning of the period both indicate that this is a conservative estimate. In the first eleven months of 1926 the average daily production of electrical energy for Canadian consumption exceeded the production during the same period in the previous year by 23.8 per cent.

Pacific Coast Jobbers Talk Over Installment Selling

Central-station merchandising, installment selling and the introduction of load-building domestic electric appliances were the subjects discussed by three speakers at the open meeting of the quarterly convention of the Pacific Division, Electrical Supply Jobbers' Association, held at Del Monte, Cal., on Jan. 29. Merchandising programs of central-station companies should be established on a basis that will encourage the greatest number of retail outlets to participate in appliance selling, S. Waldo Coleman, president of the Pacific Coast Electrical Association, asserted. Central-station merchandising, in his opinion, should be carried on at a profit under a policy that will permit dealers to compete on an equal basis. Whether the power company sells appliances itself or encourages dealers to do so, or does both, depends upon local conditions.

The history of installment selling was discussed by C. W. Banta, vice-president of the Wells Fargo Bank and Union Trust Company of San Francisco. The electrical industry has done a great service by making possible the purchase of labor-saving electrical appliances on time payments, he thought, and thereby has made necessities of devices heretofore classed as luxuries. Competition should not, however, be

Balch Plant of the San Joaquin Light & Power Company



THE Balch hydro-electric plant of the San Joaquin Light & Power Corporation, on the North Fork of the Kings River, 56 miles east of Fresno, Cal., the dedication of which was recorded in the ELECTRICAL WORLD for Feb. 5 (page 313), was built at a saving of half a million dollars under the estimated cost of $3,674,000. The power house contains one 33,000-kva. generator driven by two 20,000-hp. impulse waterwheels operating under a static head of 2,381 ft., one of the very highest in this country. It is the first unit in a chain of plants that will eventually develop 495,000 hp.

allowed to encourage extravagant use of installment purchasing. He pointed out that although the volume of installment buying in this country is tremendous, credit losses are surprisingly low, being only 0.18 per cent as against credit losses of 1 per cent in the department-store trade, 0.35 per cent in the grocery trade and 0.50 per cent in the jewelry business.

E. W. Lloyd, general contract agent of the Commonwealth Edison Company, Chicago, urged that jobbers assist central-station companies in the sale of promotional types of appliances that require pioneering. More business can thus be developed, he felt assured.

The meeting was one of the most successful in the history of the Pacific Division and was attended by Franklin Overbagh, Chicago, general secretary of the national association, and Judge Dana T. Ackerly, general counsel of the association from New York.

Byllesby System Will Spend $61,500,000 in 1927

Construction expenditures budgeted for the operated and affiliated public utilities of the Standard Gas & Electric Company for the year 1927 will total $61,500,000, according to an announcement by H. W. Fuller, vice-president in charge of engineering and construction, Byllesby Engineering & Management Corporation. The total of the authorized construction budget of the operated companies for the year 1926 was $30,417,741.

Large undertakings provided for in the 1927 budget, which have been referred to before, but are here grouped, include extension of the Pittsburgh properties, where a total estimated amount of $26,000,000 will be expended. The Colfax steam-electric generating station near Pittsburgh will be increased from 190,000 kw. to 270,000 kw. capacity, and extensive switching facilities will be installed in connection with the Brunot Island generating plant at Pittsburgh.

Next in volume and importance to the Pittsburgh undertakings is the continuation of work on the 108,000-hp. hydro-electric station for the Louisville Hydro-Electric Company, a subsidiary of the Louisville Gas & Electric Company, at the Falls of the Ohio River at Louisville.

A hydro-electric development for the California-Oregon Power Company, on the North Fork of the Rouge River, will be remarkable both for the rapidity with which it will be completed and for the unusually large amount of enrgy which will be made available. Work on this plant, which will have an initial capacity of 15,000 kw., was started in January, and it is fully expected that it will be in operation by Oct. 1 of this year. The initial development of 15,000 kw. will produce an annual output of 130,000,000 kw.-hr., it is asserted, while second and third units of the same size, to be installed as necessity for increased power becomes evident, will produce 110,000,000 kw.-hr. and 60,000,000 kw.-hr., respectively, or a total of 300,000,000 kw.-hr. from a 45,000-kw. development.

Consumers Power Program

Eleven Millions to Be Spent on Electric Department in 1927—New Transmission Method

INCLUDED in the 1927 construction program for the Consumers Power Company in Michigan are provisions for a 30,000-kw. generating unit and auxiliary equipment at the Saginaw River plant, the completion of a 20,000-kw. pulverized-fuel installation at Kalamazoo and the finishing of the company's new eleven-story general office building at Jackson. The company's program for the year contemplates the expenditure of $15,361,665, of which $11,183,882 has been appropriated for the electric department.

The Saginaw River plant now has two 20,000-kw. units and is designed for an ultimate capacity of 100,000 kw. The new turbo-generator is to be of 30,000 kw. capacity with five Walsh & Wiedener cross-drum boilers equipped with underfeed stokers. A new screen house and intake are part of this project, as is a station turbo-generator of 3,500 kw. The boilers will operate at 400 lb. pressure and each will have a boiler-horsepower rating of 1,234. A new 20,000-kw. generator in the Kalamazoo plant will be completed about June 1. The boiler equipment for this unit is unusual in that there will be no economizers, the air-preheating equipment being designed to promote boiler efficiencies which will reduce flue temperatures by from 230 deg. to 300 deg.

The company will this year try a practical experiment on its 33 miles of 140,000-volt tower line between Saginaw and Bay City by the installation of a ground wire for protection against line damage and interruptions from lightning. The Consumers' 1,650-mile transmission system is not of the grounded-neutral type and, while there exists a difference of opinion among engineers, preliminary experiments indicate the value of a separate ground wire on lines supported by steel towers. It will be installed with the thought that the ground wire later may be made part of a second circuit on the present towers in the event that experience shows a failure of the installation to serve the purpose for which it is designed.

This year's estimates do not contemplate any additional hydro-electric projects, though preliminary surveys and borings are being made on the Muskegon River in anticipation of a need in the near future for a new dam of at least 100-ft. head. A 40-mile, 140,000-volt transmission line will be built from Lansing to Jackson, directly connecting the industrial territory in the vicinity of Jackson with the company's six dams on the Au Sable River.

West Virginia Hydro Project Involves 238,000 Hp.

The West Virginia Power & Transmission Company of Morgantown, W. Va., has reported to the Federal Power Commission that it has complied with the terms of its preliminary permit, and it has filed formal application for a license covering its project on the Cheat River and tributaries in West Virginia and Pennsylvania. The company's investigations show that its proposed Blackwater dam will create a reservoir of 130,000 acre-feet capacity. It is to be connected with two power houses, where 48,000 hp. and 60,000 hp. respectively will be installed. The Beaver Hole dam will create a 20,000-acre-foot reservoir. The power house to be operated in connection with that dam is to have an installation of 80,000 hp. The Rockville dam will create 12,000 acre-feet of storage and the Clifton dam 76,000 acre-feet. The power house to be fed from those reservoirs will be equipped with 50,000 hp. In addition, there are to be two dams in the Middle Cheat, while future developments are proposed at Rowlesburg, St. George, Dry Fork, Shaver's Creek and Glady Fork.

Municipal Versus Private Plant at Watertown, N. Y.

Letters have been received by the ELECTRICAL WORLD from J. Walter Ackerman, City Manager of Watertown, N. Y., and from Arthur L. Mullergren of Kansas City, Mo., who was consulting engineer for Watertown at the time its new municipal street-lighting system was installed. Both complain that a "Briefer News" item printed on Jan. 22 with the heading "Object Lesson for Watertown, N. Y.," is misleading in saying that the city's contract to pay $31,800 for maintenance of this system plus interest charges and other liabilities will involve an annual charge of $96,699 as compared with the Northern New York Utilities' offer of $70,000.

Mr. Ackerman says that the company's offer was contingent on the city's turning over to the company the new 7,500-hp. municipal plant (Mr. Mullergren says the city was to sell the company all the power for a flat price of $100,000, the company to operate the plant) and also that the company's offer was never put in writing despite the promise of the city's officials to submit it to the taxpayers if this were done. Both Mr. Ackerman and Mr. Mullergren say that the figure $96,699 is much in excess of the actual cost to the city. The latter goes into detailed figures and makes the total amount $83,650. This, he says, covers a 15 per cent increase in the amount of street lighting as compared with the plan on which the Northern New York Utilities' figure of $70,000 was based and includes lighting the municipal building, which, if charged for at the company's rate, would cost $7,800. He estimates that the true comparison would lie between a city cost of $83,650 and a company charge of $87,800. Mr. Mullergren adds to this saving $100,000 income which he sees accruing to the city from 20,000,000 kw.-hr. excess power at the city's hydro plant, at one-half cent a kilowatt-hour, less $18,000 operating expenses. He finds a surplus for the city of approximately $75,000 a year. The letters of Mr. Ackerman and Mr. Mullergren go further into the history and statistics of the Watertown situation. They are too long to print except in synopsis.

Briefer News

Vermont Electrical Association to Meet. — The Vermont Electrical Association will hold its winter meeting at Burlington, at the Hotel Vermont, on Thursday, Feb. 17. A business session in the afternoon will be followed by a banquet at which R. W. Bowdoin, research executive of the New England Council, will speak.

New Pekin Plant of Insull Interests to Aid in Railroad Electrification.—The generating station to be built on 400 acres of land purchased near Pekin, Ill., by the Insull utility interests will, it is understood, be employed in part in the electrification of the Chicago & Illinois Midland Railway, a steam railroad which is now an Insull property. The rating and other details of the plant have not yet been determined.

Houston Lighting & Power's Program for 1927.—Improvements to cost approximately $4,730,700 will be made to its plants and system by the Houston Lighting & Power Company this year, according to a report just made by the company to C. F. Kirk, Public Service Commissioner of Houston. The largest of the proposed expenditures is $2,200,000 for new turbines and improvements to the company's power plant at Deepwater.

Governor Pinchot Opens Washington Office.—Ex-Governor Gifford Pinchot of Pennsylvania has opened an office at Washington through which he will seek to promulgate his views on "giant power" and the regulation of public utilities. The report on giant power which he spread before the Pennsylvania Legislature after it had been compiled by a committee of his appointment has been revised and will be widely distributed. Mr. Pinchot has called the especial attention of President Coolidge to this report.

Gould Street Station Goes on Lines in Baltimore.—The Gould Street station of the Consolidated Gas, Electric Light & Power Company of Baltimore was started up recently. This power house harbors, as a first unit, a 35,000-kw. turbo-generator. It burns pulverized coal and uses preheaters. The furnaces are exceptionally large, the volume under the tubes being approximately 21,000 cu.ft., and the boilers are among the largest straight-tube boilers in existence. Steam is generated at a pressure of 450 lb., which is more than twice the operating pressure at the company's Westport station. Energy is generated at 13,200 volts for transmission to the new switch house at Gould Street and thence to the city substations.

Survey on the Little Tennessee, North Carolina.—A survey of the Little Tennessee River in western North Carolina has been made recently, and big hydro-electric developments are rumored, though nothing definite has been announced by any company that might be concerned. The portion of the river involved includes the Nanthala Gorge. It is reported that sites for three dams are available. The Aluminum Company of America, which is believed to have acquired rights in the gorge several years ago, has a hydro-electric plant on the Little Tennessee at Maryville, across the Tennessee state line.

Warriner Would Get Power from Lehigh River.—Power from the Lehigh River between Easton and White Haven, Pa., is to be utilized for the development of electrical energy for industrial and domestic consumption, if a plan understood to have been proposed by Samuel D. Warriner, president of the Lehigh Coal & Navigation Company, is carried out. There is a drop of over 500 ft. between White Haven and Mauch Chunk and 360 ft. between Mauch Chunk and Easton, and the plan provides for a series of power plants, probably at every 200-ft. drop.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, Jan. 1, page 80.]

New Mexico Utilities Association—Franciscan Hotel, Albuquerque, Feb. 14-16. B. L. Wiles, Albuquerque Gas & Electric Co., Albuquerque.

Kentucky Association of Public Utilities—Brown Hotel, Louisville, Feb. 18 and 19. E. F. Kelley, Louisville Railway Co., Louisville.

Iowa Section, N.E.L.A.—Dubuque, Feb. 24 and 25. H. E. Weeks, Davenport, Iowa.

Oklahoma Utilities Association—Huckins Hotel, Oklahoma City, March 8-10. E. F. McKay, 307 Local Building, Oklahoma City.

Northwest Electric Light and Power Association, Engineering Section—Portland, Ore., March 10 and 11. O. L. LeFever, Northwestern Electric Co., Portland.

American Institute of Electrical Engineers—Southwestern District, Kansas City, March 17-18; Middle Eastern District, Bethlehem, Pa., April 21-23; Northeast District, Pittsfield, Mass., May 25-27. F. L. Hutchinson, 36 West 39th St., New York.

National Electrical Manufacturers' Association, Policies Division.—Briarcliff Manor, N. Y., March 17-18. S. N. Clarkson, 30 East 42d St., New York.

Illinois State Electric Association—St. Nicholas Hotel, Springfield, Ill., March 17 and 18. R. V. Prather, 205 Illinois Mine Workers' Building, Springfield, Ill.

Southeastern Division, N.E.L.A.—Peabody Hotel, Memphis, Tenn., April 13-15. C. M. Kilian, 404 Wynn-Claughton Bldg., Atlanta.

Southwestern Division, N. E. L. A.—New Orleans, April 26-29. S. J. Ballinger, San Antonio Public Service Company, San Antonio, Tex.

Southwestern Public Service Association—New Orleans, April 26-29. E. N. Willis, 403 Slaughter Bldg., Dallas, Tex.

Nebraska Section, N. E. L. A.—Grand Island, Neb., April 27-28. H. M. Davis, 1519 O St., Lincoln.

American Electrochemical Society—Benjamin Franklin Hotel, Philadelphia, April 28-30. Colin G. Fink, Columbia University, New York.

Missouri Association of Public Utilities—Cape Girardeau, May 5-7. F. D. Beardslee, 315 North 12th St., St. Louis.

Middle West Division, N.E.L.A.—Topeka, Kan., May 18-20. H. M. Davis, 1519 O St., Lincoln, Neb.

National Electric Light Association—Atlantic City, N. J., June 6-10. Paul S. Clapp, 29 West 39th St., New York.

Rehearing Denied in Herminghaus Water-Rights Case. — The California State Supreme Court has denied a petition for a rehearing of its decision permitting the Herminghaus estate of 18,000 acres in Fresno and Madera Counties to use the full flow of the San Joaquin River for the irrigation of its acreage. (See ELECTRICAL WORLD for Jan. 29, page 266.) Suit in the Superior Court to protect the company's claims to riparian ownership and its right to utilize the waters of the San Joaquin River and tributaries is still pending, though the Herminghaus heirs on Jan. 27 filed demurrers asking that it be quashed.

Fort Atkinson, Wis., Unwillingly Gets Plant Back.—The legal finding recorded under "Recent Court Decisions" (page 374) whereby the Fort Atkinson (Wis.) electric light and power plant is restored to public ownership on technical points after the citizens had voted to sell it to the Wisconsin Gas & Electric Company has prevented the promised reduction in rates from going into effect about Feb. 1, as it otherwise would have done. However, the company has agreed that if the Supreme Court shall reverse the decision and find the Nov. 2 election valid, then the company upon taking possession again will refund to all consumers the difference between what they pay under the old city rates and the amount they would have paid the company had the lower rate schedule gone into effect.

Rate-Base Issue in Worcester Case.—Contending that the rate base upon which earnings should be figured is a plant valuation of more than $17,000,000 instead of a capital stock and premium account totaling less than $5,000,000, R. G. Dodge of Boston opened the evidence on behalf of the Worcester Electric Light Company last week in the pending rate case before the Massachusetts Department of Public Utilities. Less than 5 per cent dividends is earned upon the above valuation, assuming the average return to be $800,000 per year applicable to this purpose. Mr. Dodge cited recent decisions of the United States Supreme Court which he declared sustain the company's method of computing its rate base. The valuation presented was made by company engineers, Stone & Webster and others.

Geological Survey Issues New Maps of Umpqua River.—Topographic surveys of the Umpqua River, one of the most valuable water-power streams in Oregon, were made by engineers of the Geological Survey in 1925, and the resulting maps have just been issued in three colors, on the scale of half a mile to the inch. The upper end of the river, from Soda Springs to Bradley Creek, 31 miles, and Lake Creek from the mouth to Diamond Lake, 12 miles, are mapped on a scale of 4,000 ft. to the inch. Umpqua River and North Umpqua River are shown from Scottsburg, at the head of tidewater, to Bradley Creek, a distance of 181 miles; Mill Creek from the mouth to the head

of Loon Lake, 17 miles; Calapooya Creek from the mouth to Oakland, 13 miles; Steamboat Creek for 9 miles above the mouth; Fish Creek from the mouth to Rough Can Creek, 9 miles; Clearwater River from the mouth to Lava Creek, 10 miles, and Lake Creek from the mouth to Diamond Lake, 12 miles. Seventeen dam sites with cross-sections are shown on a scale of 400 ft. to the inch. These maps can be purchased from the Geological Survey for 10 cents a sheet, there being seven sheets in all.

Galva (Ill.) Citizens Object to High-Tension Towers. — Construction of a high-power line by the Illinois Power & Light Corporation from the Keokuk Dam to La Salle, Ill., has met opposition at Galva, Ill., where citizens object strenuously to the erection of towers in front of their property, contending that it will reduce its value and interfere with radio reception. One crew of fifteen men was stopped from excavating by court order.

Progress on Black River (Mo.) Hydro Project.—Preliminary work on the five-million-dollar hydro-electric dam to be erected (as previously reported) on the Black River near Piedmont, Mo., 130 miles southwest of St. Louis, has been started. The Black River Hydro-Electric Company, of which H. D. Mepham of New York is president, will maintain offices in New York, St. Louis and Poplar Bluff, Mo. The dam will be 130 ft. high, giving a head of 130 ft., and 1,700 ft. long. It will be constructed of earth with a concrete core-wall and spillway. It is planned to construct a 30-ft. highway over the top of the dam. The power plant will be on the far side of a tall bluff skirting the eastern bank of the stream. The water will be brought through a 700-ft. tunnel and after passing through the power plant will rejoin the river several miles below the dam site. The city of Poplar Bluff has leased its power plant to the new company and will be furnished with electric light and power from the dam when it is completed.

No Significance in Examination of Flaming Gorge Site at This Time.—The representative of the Corps of Engineers of the United States Army at Salt Lake City is about to undertake an examination of the Flaming Gorge project on Green River, it is understood. The Utah Power & Light Company recently applied for a license for this project after having completed the studies required by its preliminary permit, and the field examination follows in the regular routine of the commission. Action on a license must await the withdrawal of the commission's resolution suspending consideration of all Colorado basin projects, and indications are that the commission will wait until after this session of Congress before acting on either the Girand license for Diamond Creek or the Flaming Gorge application. If Congress fails to act on Colorado River legislation, it is believed probable that the commission then will withdraw its resolution, issue the Girand license and consider the other pending applications covering projects in the basin.

Men of the Industry

Luke C. Bradley Heads Rhode Island Company

Luke C. Bradley, president of the Virginia Electric & Power Company, Richmond, Va., has resigned to become president of the Rhode Island Public Service Company, Providence. He will succeed L. C. Gerry about Feb. 20. Mr. Bradley is widely known in the electric utility field. For the past 22 years he has been associated with Stone & Webster, Inc., Boston, in executive capacities and has had charge of numerous public utilities in the South and West. He became president of the Virginia company in 1925 and in his new field will supervise the operations of the Narragansett Electric Lighting Company and the United Electric Railways, which have been merged in the Public Service company. Mr. Bradley will be succeeded as president of the Virginia Electric & Power Company by William E. Wood, now a vice-president of the company. Mr. Wood has been a member of the Stone & Webster organization for about 20 years and prior to becoming vice-president of the Virginia Electric & Power Company he was general manager of the Galveston-Houston Electric Railway.

General James G. Harbord, president of the Radio Corporation of America, sailed for Europe Feb. 4 aboard the Cunard liner *Aquitania.*

Herbert Ziegenbein, formerly connected with the Jackson district of the Consumers Power Company, has been transferred to the Kalamazoo district in the capacity of power engineer.

W. P. Schoenoff has been appointed superintendent in charge of the electric distribution department of the Wisconsin Power & Light Company at Fond du Lac.

Harry Rieman, formerly district engineer for the Central Hudson Gas & Electric Company at Catskill, N. Y., has been transferred to that organization's engineering department at Kingston.

W. R. Bowers, formerly district superintendent of the Adairsville district of the Georgia Railway & Power Company, has been transferred to the Georgia Southern Power Company and will have his office at Swainsboro as district superintendent.

A. F. Davey, manager of the Wisconsin Public Service Corporation's properties at Sheboygan, has been named manager of the Sheboygan-Manitowoc division of the company, under a recent plan placing in effect a redistricting of the operating divisions. Mr. Davey will have jurisdiction over the electric and gas properties operated in the newly named division, as well as of transportation operations.

Fred H. Sargent has been elected president of the Lawrence (Mass.) Gas & Electric Company, succeeding Irvin McD. Garfield, of Boston, who has been made chairman of the board of directors. Mr. Sargent entered the employ of the company in 1889 as a timekeeper. He had advanced to the post of assistant agent in 1904, in 1919 became agent and later vice-president. Control of the company was recently acquired by the New England Power Association.

J. D. Walker, Jr., has been appointed manager for the South Georgia Power Company in Sparta. Mr. Walker will also be in charge of the retail store to be opened in that city.

C. B. Stelle of Indianapolis, who has been superintendent of the Merchants' Heat & Light Company, has been made superintendent of the municipal light and water plants at Anderson, Ind.

Elmore Allman has been appointed manager of the Lake Superior District Power Company's electric properties at Medford, Wis., succeeding **W. C. Walton,** who will assume new duties in Chicago.

W. C. Dowdy, district manager of the Public Service Company of Northern Illinois in Kankakee, has been named district manager to succeed B. G. Smith in Chicago Heights. Previous to his connection at Kankakee, Mr. Dowdy was district manager at Streator.

Frank H. Martin, formerly manager of the insurance department of the Georgia Railway & Power Company, has been appointed manager of the company's new investment department. **D. C. Jones, Jr.,** has been appointed manager of the insurance department to succeed Mr. Martin.

E. A. Wright, formerly in charge of the North Michigan properties of the General Engineering & Management Corporation, is now directing the activities of the Kansas Power Company and the affiliated companies—the Phillips County Power & Light Company, United Light & Power Company and Central Kansas Public Service Company.

Clement J. Studebaker, Jr., Chicago, for the last twelve years associated with the Illinois Power & Light Corporation as president and with the North American Light & Power Company as chairman of the board of directors, has been made a trustee of the Illinois Wesleyan University at Bloomington, Ill. He is also trustee of DePauw University, Greencastle, Ind.

Charles Mikulesky, who has been sales manager of the Wisconsin Gas & Electric Company at Racine for the past ten years, has been promoted to be general sales manager of the company. His new duties give him supervision of all appliance activities in southeastern Wisconsin.

Frederick W. Schmidt, for nineteen years division agent of the Hudson division of the electric and gas departments of the Public Service Electric & Gas Company, Newark, N. J., has been appointed general agent of the company, a new position. Mr. Schmidt will have supervision over the entire commercial territory of the company, reporting directly to the vice-president in charge of finance. Mr. Schmidt started with the Jersey City Gas Light Com-

pany Jan. 8, 1896, as bookkeeper. In 1901 he was appointed agent at Jersey City of the Hudson County Gas Company, and division agent, gas department, Public Service, in 1903. He was made agent of the United Electric Company of New Jersey in 1904 and in 1908 was appointed division agent for both gas and electric departments of Public Service.

E. T. Gilbert of the Narragansett Electric Lighting Company, Providence, R. I., was elected chairman of the Electric Lines Club of New England at the recent annual meeting held in Boston. **A. H. Robbins** of the Electric Light & Power Company of Abington & Rockland being made secretary.

H. A. Nesbitt, formerly chief engineer of the Eastern Shore Gas & Electric Company, Laurel, Del., has resigned to accept a similar position with the Gulf Public Service Company, with headquarters in Texas. **H. W. Sterling,** operating engineer at Laurel for several years past, has succeeded Mr. Nesbitt as chief engineer.

D. E. Karn, who has been affiliated with the Jackson office of the Consumers Power Company for seven years, has been appointed district manager of the company at Kalamazoo to succeed F. W. Blowers, retired. Mr. Karn, who is a vice-president of the company, was manager of the securities department at Jackson.

Homer J. Ludden, manager for the past two years of the Wisconsin Valley Electric Company's properties at Waupaca, has been transferred to a similar position as manager of larger properties at Antigo. **William J. Roach,** who has been connected with the main office of the company at Wausau, will fill the post left vacant at Waupaca through the promotion of Mr. Ludden.

W. G. Murrin, vice-president of the British Columbia Electric Railway Company, Ltd., Vancouver, B. C., has been appointed a director of the company. Mr. Murrin has been affiliated with the company since 1913, when he was appointed mechanical superintendent after removing his interests from England to Canada.

Lewis E. Young, for the past eight years connected with the Union Electric Light & Power Company of St. Louis, the East St. Louis (Ill.) Light & Power Company and the Alton (Ill.) Electric Company, has been elected vice-president in charge of operations for the Pittsburgh Coal Company. Mr. Young severed his connection with the Union Electric Light & Power Company and its allied companies Jan. 3 to take up his new duties in Pittsburgh. He will have direct control of all the mines and lands of the company, including about 175,000 acres of coal lands in Pennsylvania, Ohio and eastern Kentucky, together with various subsidiary operations. Eight years ago Mr. Young was placed in charge of the development of the steam-heating department of the Union Electric Light & Power Company and later became general manager of the Union Colliery Company, Dowell, Ill., a subsidiary of the Union Electric. He is a director of the East St. Louis Light & Power Company, the Alton Gas Company and the Alton Electric Company.

Harry Reid New President of National Electric Power Company

Harry Reid, who has been elected president of the National Electric Power Company, has been a prominent figure in public utility circles in Kentucky and the Middle West for twenty years, though a native of New York. He first entered the electric light and power industry as an employee of the Fulton County Gas & Electric Company, Gloversville, N. Y., and after serving that utility in various capacities, he, with several others, purchased the Versailles (Ky.) Electric Light Company. Mr. Reed became interested in syndicating a number of public utility companies in central Kentucky and later affiliated himself with the Kentucky Utilities Company, which was organized by the Insull interests, in the capacity of vice-president and general manager. In 1913 he was elected president and in 1917 he was elected to the presidency of the Interstate Public Service Company.

HARRY REID

Mr. Reid has devoted considerable attention to association work, having taken an active part in the affairs of the National Electric Light Association, the American Institute of Electrical Engineers, the American Electric Railway Association and the National Institute of Social Sciences.

George S. Terry has joined the electrical division of Stone & Webster, Inc., Boston. Mr. Terry is a graduate of the University of London, England, and did considerable power station work in that country before removing to America with the British War Mission in charge of the Buffalo and Western New York District for the inspection of steel and munitions.

Alvin E. Gerg, who had been connected with the Wisconsin Power & Light Company since 1918, has resigned as division commercial manager of the company. Mr. Gerg was in charge of the commercial activities of the company in Fond du Lac, Sheboygan, Oshkosh and other smaller neighboring communities. What his future plans are Mr. Gerg did not disclose.

J. R. Tozer, formerly superintendent of the electric and water departments of Swanton, Vt., has lately been appointed superintendent of the Burlington Electric Light Department, succeeding M. G. Clark, who was made vice-president and general manager of the Foshay interests in Vermont. These interests include what was formally the Montpelier & Barre Light & Power Company, several other properties in that vicinity and the Vergennes Power Company. Mr. Tozer assumed his duties at Burlington on Jan. 15.

W. P. Crowley, who has been district superintendent in the Maywood-Elmhurst region of the Public Service Company of Northern Illinois for approximately two years, has been promoted to the position of district manager at Kankakee. **H. W. Lee,** formerly connected with the company's construction department in the general offices, will succeed Mr. Crowley as superintendent of the Maywood-Elmhurst district.

Lucien R. Shattuck, formerly manager of the engineering department of Sanderson & Porter, has been admitted as a partner in the firm. **Frank W. Lawrence,** formerly manager of the operating department, and **Frederic G. Coburn,** formerly manager of the industrial department, have also been added as partners. The new partners have long been associated with Sanderson & Porter in these important executive capacities. The other partners of the firm are E. N. Sanderson, H. Hobart Porter, Francis Blossom, Richmond Talbot, Wynn Meredith and Seton Porter.

Donald M. Mackie has been appointed to direct special advertising for public utility companies under Hodenpyl-Hardy management. He will co-operate with the managers of the various properties in the preparation of campaigns and of good-will advertising programs. Mr. Mackie first entered the service of the organization as employee in the construction department of the Eastern Michigan Power Company in 1917. Subsequently he worked in the steam plant of the Springfield (Ohio) Light, Heat & Power Company and was appointed commercial manager of what is now the Ohio Edison Company in 1919. Following the inauguration of customer-ownership he became a member of the customer-ownership department of the Hodenpyl-Hardy organization at Jackson, Mich., where he was up to the time of the recent change.

Harry E. Miller has been appointed works manager of the Newark plant of the Westinghouse Electric & Manufacturing Company after an affiliation with that organization which dates back to 1889. On entering the employ of the Westinghouse company at Pittsburgh, Mr. Miller was assigned to the machine and tool departments and later moved to the erection and test sections. Eleven years later he was transferred to the Newark factory of the Westinghouse company as foreman of the inspection and tests of ammeters and watt-hour meters and also fan motors. Mr. Miller continued as an executive of the Newark plant of the Westinghouse company, advancing to be assistant superintendent, superintendent, then assistant works manager and finally manager of the entire Newark works. During his association with the Westinghouse company Mr. Miller has acquired an accurate knowledge of engineering, shop work and products through actual experience and personal

contact with the manufacturing operations and has applied his knowledge to improvements in the design and manufacture of the products of the company.

W. M. Large, who for several years has been manager of the Interstate Power Company at Oakland City, Ind., has been promoted to the position of division superintendent of the company, with offices at Connersville, Ind. Mr. Large has been succeeded in his position at Oakland City by Reece Burns.

L. W. Lee, superintendent of the Kansas Electric Power Company, Emporia, has been made superintendent at Eureka, Kan. He will be succeeded at Emporia by Herbert Edwards.

R. L. Collier, who has been identified with the Cleveland Electric Illuminating Company in various departments for the past two years, has joined the staff of the Artistic Lighting Equipment Association in Cleveland as assistant to the managing director. Mr. Collier's experience in engineering and sales work particularly fits him for association activities.

John E. Cunningham has been named commercial manager of the Eastern New Jersey Power Company, with headquarters at Asbury Park. After finishing his education at the University of Michigan, in the College of Electrical Engineering, Mr. Cunningham entered the employ of the General Electric Company in Harrison, N. J., where he spent two years as electrical engineer. During the past three years Mr. Cunningham has been illuminating and industrial engineer of the Pennsylvania Power & Light Company, Allentown, Pa. He will serve as consultant to local architects, contractors and electrical contractors and in the making of residential, commercial and industrial lighting lay-outs and power installations.

Obituary

Shiras Morris, president and treasurer of the Hart & Hegeman Manufacturing Company, Hartford, Conn., and prominently identified with many banking and industrial interests, died Feb. 2, at his home in West Hartford. A native of Pittsburgh and a graduate of Trinity College, Mr. Morris was employed by the Pope Manufacturing Company, Hartford, before joining the Hart & Hegeman Company in 1898. He was elected secretary in 1899, treasurer in 1901 and in 1914 was elected president. Mr. Morris was a director of the Connecticut Mutual Life Insurance Company, Phoenix State Bank & Trust Company, Dime Savings Bank, the Hartford Steam Boiler Inspection & Insurance Company, Terry Steam Turbine Company, the Electric Porcelain & Manufacturing Company, the Peck, Stowe & Wilcox Manufacturing Company and the H. T. Paiste Company. He was a trustee of Trinity College and Choate School, Wallingford. During his career Mr. Morris was president of the Associated Manufacturers of Electrical Supplies and treasurer of the Manufacturers' Association of Connecticut. He was a former director of the Bristol Brass Company, Bush Manufacturing Company and the Billings & Spencer Manufacturing Company. He was also at one time president of the Johns Pratt Company.

Recent Court Decisions

In Condemnation Suit No Need Exists for Power Company to Introduce Evidence Regarding Land Not Sought.—The Illinois Power & Light Corporation petitioned the Warren County (Ill.) Court for permission to condemn a site for a suspension tower within and an easement across a tract of land owned by one Peterson for the construction, maintenance, operation and repair of a high-power electric transmission line, accompanying the petition with an order of the Illinois Commerce Commission granting the requisite certificate of convenience and necessity and the right to exercise the power of eminent domain. The trial court fixed the compensation to Peterson for the land actually taken at $1.80 and damages to the land not taken at $1,049. In reversing the judgment and remanding the cause, the Supreme Court of Illinois held, on suit of the company against Peterson, that in proceedings to condemn land for a power line the power company was not required to introduce evidence regarding the land not sought to be taken or described in petition. (153 N.E. 577.)*

Duties of Commission in Determination of Interests of Municipality Contemplating Sale of Plant.—In voiding the municipal election in which Fort Atkinson (Wis.) voters agreed to sell their plant to the Wisconsin Gas & Electric Company (see ELECTRICAL WORLD for Jan. 22, page 219), the Circuit Court said: "This conclusion is based on two primary facts, first, that the finding of the Railroad Commission was not what the law requires in that it failed to determine whether the interests of the municipality and the residents thereof will be best served by the sale. This requirement cannot be waived by any one taxpayer assuming to act for all the rest. The statute in explicit language requires such determination, and the question of sale cannot be legally submitted to the electors until such determination has been made. The electors are entitled to be advised in the matter by their commission, created and maintained by them for such and kindred purposes, before they can be asked to vote upon the question of parting with any of their valuable utilities; and the situation is aggravated when, contrary to the fact, they are informed that the commission has advised a sale. There are many things connected with the possession and operation of public utilities that may make it advisable either to hold them or to get rid of them by sale, as the case may be. Such things come readily within the ken of the commission, which is in constant, state-wide contact with the business and has large experience with such matters, while they remain unknown to the average citizen. That the public may not either hold or part with its possession against its own best interests the commission is required to give it the benefit of its investigation and experience by advising which way the public's best interests will be served. The final determination, of course, rests with the voters after they have been advised by the commission, and they may reject the advice given or accept it, as they see fit. The other principal reason for holding the election void is that the one notice of election which was published the required number of days before the election did not comply with the statute."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

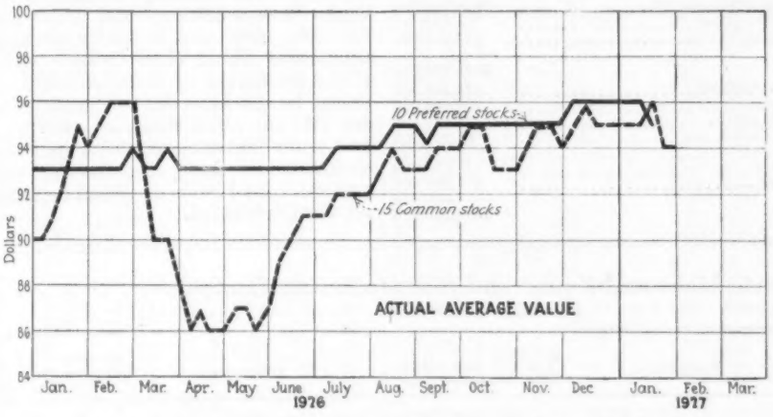
Indiana Commission to Forbid Inclusion in Rate Base of Discontinued Plants of Purchased Companies.—The Indiana Public Service Commission has started a state-wide investigation to determine whether non-used and non-useful property is being included by utilities in the base for rate-making purposes, especially in cases involving the sale of small utilities to larger companies. The commission will concern itself with instances where large utilities have bought smaller ones along with their equipment and will ascertain whether in such cases the buying concerns have abandoned use of the properties of the smaller ones but have included them in the basis of rates. The commission will regard equipment held for stand-by purposes as used and useful property.

Utility Company Not Under Obligation to Advise Customer of Most Advantageous Schedule. — The Indiana Public Service Commission has held, in adjudicating a complaint brought against the Indiana General Service Company by the Hoosier Stove Company, that an electric company has no duty to insure that a consumer is operating under the most advantageous schedule. In the case at issue the consumer made several complaints to the utility of excessive power bills, but made no investigation of the schedule of rates and no attempt to revise the installation or to reduce the load, although advised that a reduction of bills was possible in this way. Later, after conference with representatives of the utility as to the rate classification, it was concluded that the plant should have been operating under a more advantageous schedule and that the installation and power loadings should have been revised to reduce the demand. The consumer then charged that it was the duty of the utility to advise and see that the consumer operated in accordance with the most advantageous schedule and conditions. The commission, however, held that it was neither the right nor the duty of the utility to act as the manager or superintendent of the consumer and that there was no basis for an award of reparation.

Financial and Corporate

Utility Stocks Take Second Place
Bonds Make Further Gains
Markets Continue Erratic

UTILITY stocks have been pushed into the background temporarily by the wild orgy of speculation in certain of the railway stocks which has thrown the entire market into confusion for the past two weeks. Power and light issues generally have followed the aimless movement of all the markets. Certain favored issues are being featured by buyers—not always on the basis of earning merit—and any real trend either up or down is lacking. February has come to be looked upon as a danger period for the security markets, and this February is living up to the reputation.



AVERAGES SHOW STABILITY OF POWER AND LIGHT STOCKS

Common stocks of the power and light companies made a few marginal gains but no outstanding advances. Middle West Utilities moved up two more points to 114 and Edison Electric Illuminating of Boston advanced four points to 223. The average of fifteen representative common stocks gained one point to 95. The preferred stock average also gained slightly more than a point. This was due again to a large number of marginal advances rather than to any large individual gains.

The bond market continues to gain strength despite the unusual interest in stocks and despite the report issued this week that the bill to legalize savings bank investments in public utility bonds is unlikely to be passed by the New York State Legislature, at least in its present form. The fact that the bond market is able to disregard such an announcement is one of the best arguments for its passage.

Public Service Stockholders Approve Stock Increase

Stockholders of the Public Service Electric & Gas Company in special meeting Jan. 31 unanimously approved an amendment to the company's charter increasing its authorized capital stock by $30,000,000. The action was taken as part of the plan for the merging of underlying companies now held under lease, the stocks of which may be exchanged for either the Electric & Gas company's 6 per cent preferred, common stock of Public Service Corporation of New Jersey or cash. Under the amended charter no change was made in the number of authorized shares of the common stock or the 7 per cent or 6½ per cent preferred stock issues of the Electric & Gas company, but the number of 6 per cent preferred shares was raised from 700,000 to 1,000,000, all to be as of the 1925 issue. It is the latter class of preferred stock that is being offered for shares of underlying companies to be merged.

Utility Bonds Called in February Total $29,672,300

Among the corporate bonds called for payment in February in advance of maturity were electric light and power securities totaling $29,672,300. Of this amount $29,389,600 represents entire issues called, while $282,700 represents issues called in part. It is interesting to note that one foreign company appears in the list—the Great Consolidated Electric Power Company of Japan.

Issues	Due	Amount
San Joaquin Lt. & Pwr., ref. 6s	1950	$13,427,000
San Joaquin Lt. & Pwr., ref. 5s	1950	799,000
Southwestern Gas & El., ref. 5s	1932	4,045,000
Staten Island Edison, 6½s	1953	3,699,100
New Jersey Power & Light, 5s	1936	3,106,000
Staten Island Edison, 6s	1964	1,570,000
Indiana Power, 5½s	1928	1,000,000
Susquehanna County Lt. & Pwr., 6s	1943	600,000
North Penn Power, 6s	1953	450,000
Southern Illinois Lt. & Pwr. ref., 6s	1942	423,000
Southern Illinois Lt. & Pwr., 7s	1929	125,000
Milford Light & Power, 5s	1938	145,500
Great Cons. Electric Pwr., 7s*	1944	250,000
Northern N. Y. Utilities, 6s*	1943	18,700
Springfield Lt., Ht. & Pwr., 5s*	1929	14,000

* Not entire issues.

$2,000,000 Customer Sale of Stock in Five Hours

In five hours in the month of January the Montana Power Company sold 24,160 shares of stock, having a par value of $2,416,000, in 2,328 transactions. The actual price was $80 a share. The achievement was modestly chronicled in a note on the company's regular monthly report to the ELECTRICAL WORLD statistical department.

Current Methods of Financing—II

Financial Institutions Stand Second Only to Individual Investors in Providing Capital for Power and Light Industry

THERE is nothing on the horizon at present to suggest that the power and light industry will have any difficulty in securing the billion and a half of capital required in 1927. Interest rates today are more favorable for this type of financing than for some years. Each group of investors is expanding annually. Yet financial executives of the utilities are obliged to look ahead some distance—to weigh the probability of a change in interest rates—to consider the possibility of the saturation point being reached in any one of the sources of capital.

The three main sources of capital for the industry are institutional investors, individual investors and customer investors. Up to the present the first two sources have expanded continuously, while the third is more or less arbitrarily expanded and contracted according to the current needs of the industry. Last year the first two classes contributed some $1,150,000,000 while customers contributed slightly under $250,000,000.

Contributions by individual investors in the aggregate depend upon the amount of capital saved each year and on the attractiveness or reputed attractiveness of the issues being offered, in comparison with other offerings. Figures compiled by the National Industrial Conference Board show that yearly net additions to capital in the central-station industry averaged $200,000,000 between 1913 and 1918, and since that time the average has increased by four and a half times. From 1913 to 1918 annual savings increased by six times. Since then they have increased 81 per cent against a 100 per cent increase in capitalization. In other words, during the entire period annual additions to electrical investment were almost parallel with new savings, the growth being approximately two and a half times against annual additions to savings of two and

four-fifth times. This suggests a growth in available capital at least as rapid as that of national savings.

Investment by insurance companies, banks and other financial institutions in public utility securities is expanding at a rapid pace. On Jan. 1, of this year, 52 of the leading life insurance companies having 92.4 per cent of the assets of all United States life companies held $819,000,000 of these securities. This constituted 6.9 per cent of their total admitted assets. The expansion of the total from year to year was as follows:

INSURANCE COMPANIES EXPAND HOLDINGS

	Amount	Percentage of Admitted Assets
Dec., 1921	$223,605,000	3.0
Dec., 1925	619,621,000	5.8
Sept., 1926	765,424,000	6.6
Jan., 1927	819,000,000	6.9

As will be noted, the total increased by about four times in five years. The larger companies have been quicker to recognize the value of these securities. At present the Metropolitan Life Insurance Company, for example, holds $157,718,508 in utility bonds and stocks, out of a total of $855,750,370 which it holds in bonds and stocks of all companies. Similar figures now being compiled for fire and casualty companies show huge holdings of these issues.

In the case of the banks complete totals are not yet available. One or two examples, however, will show the trend. A study made by the Research Bureau for Public Utility Securities shows that mutual savings banks in the mutual savings bank states have estimated holdings of utility securities totaling probably slightly over $1,000,000,000, or approximately 15 per cent of deposits. Legal restrictions in these states aimed to protect depositors would allow of a total holding of about $1,832,000,000, so that this source is not taken advantage of to much more than 50 per cent.

UTILITY STOCKS HELD BY NATIONAL BANKS

Central Reserve cities	$33,739,000
Reserve cities	81,432,000
Country banks	380,068,000
	$495,239,000
New England	$73,365,000
Eastern	208,598,000
Southern	14,509,000
Middle Western	61,354,000
Western	8,113,000
Pacific	11,079,000
Other	118,221,000
	$495,239,000

In the case of national banks the total holdings of public utility bonds for the country as a whole as of June 30, 1925, were approximately half a billion dollars. The accompanying classification of these holdings, first according to the Federal Reserve Bank classification of cities and second according to geographical area, may be of interest.

While the above data do not present a complete picture of the institutional holdings of utility securities, they include the majority of such issues. Figures recently compiled by the National Electric Light Association indicate that customer sales over the past ten or twelve years total well over $1,000,000,000. As already stated savings banks have a similar total. The figure for life, fire and casualty insurance companies would seem to be conservatively estimated at $1,500,000,000. National banks have $500,000,000. There are also the other financial, educational and trust institutions which hold large quantities of these securities as an investment, and each of which represents an elastic market.

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Feb. 8	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no pr.	k 84½	83	87½
Adirondack Pwr. & Lt.—7% pf.	108	101*	108½*
Adirondack Pwr. & Lt.—8% pf.	112	101*	115*
Ala. Pwr., 7% pf.	109	....	....
Allis-Chalmers Mfg., 7% pf.	k109	110	111
Allis-Chalmers Mfg., 6% com.	90½	88	92½
Aluminum Co. of Amer., com.	71	....	....
Aluminum Co. of Amer., 6% pf.	101	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	87½	87½	89½
Amer. & Foreign Pwr., com.—no par.	20½	19	23
Amer. Bosch Magneto, com.—no par	14½	13	17½
Amer. Brown Boveri Elect.	37	34½	39½
Amer. Brown Boveri Elec., pf. $7.	k 96½	95½	98
Amer. Gas & Elec., 6% pf.—no par.	97½	96½	98½
Amer. Gas & Elec., com.†—no par.	73½	68½	100½
Amer. Lt. & Trac., 6% pf.	112	105*	132*
Amer. Lt. & Trac., com.†	230	224½	233
Amer. Pwr. & Lt., 6% pf.	98½	97½	98½
Amer. Pwr. & Lt., com.†—no par.	57	54	61½
Amer. Pub. Serv., 7% pf.	96	92*	97½*
Amer. Pub. Serv., com.†	50	45*	80*
Amer. Pub. Utilities, 7% pr. pf.	87	73*	89*
Amer. Pub. Utilities, 7% pfc. pf.	71	86*	95*
Amer. Pub. Utilities, com.	m66	68*	82*
Amer. States Sec., A.	3½	2*	9½*
Amer. States Sec., B.	3½	1½*	5½*
Amer. Superpwr., $6 pf.—25.	28½	26½	28½
Amer. Superpwr., 7% pf.	l 94½	....	....
Amer. Superpwr., Class A†—no par.	29	27½	29½
Amer. Superpwr., Class B†—no par.	29½	28½	30
Amer. Wtr. Wks. & Elec., 7% pf.	106½	105½	110½
Amer. W. W. & E., com. $1.20—20.	65	62½	67½
Anaconda Copper Cap. $3.	46½	46½	49½
Appalachian Electric Pwr., 7% pf.	k 99	90*	101*
Appalachian Elec. Pwr., 2d pf., 7%.	98	90*	102*
Appalachian Elec. Pwr., com.	m78	....	....
Arizona Pwr., 7% pf.	79	60*	82*
Arizona Pwr., com.	23	....	....
Arkansas Cent. Pwr., pf.—$7 no par.	k101	99*	107*
Arkansas Lt. & Pwr., 7% pf.	103	96*	104*
Arkansas Lt. & Pwr., com.	100	110*	115*
Assoc. Gas & Elec., $3.50—50.	51	....	....
Assoc. Gas & Elec., pf.—$6—no par.	87	79½*	86½*
Assoc. G. & E., Class A, $2.50—no par	41	35	41
BABCOCK & WILCOX, 7% com.	117	117*	151*
Binghamton L., H. & P., $6 pf.	91	90*	95*
Birmingham Elec., pf.—$7—no par.	106	101*	108*
Blackstone Valley G. & E., $6 pf.	102	103*	106*
Blackstone Valley Gas & Elec., 10% com.—50.	k105	100½*	106*
Blaw-Knox, com.†	m 73	70	73
Brazilian Trac., Lt. & Pwr., com.†	f117½	....	....
Broad River Pwr., 7% pf.	96	93*	98*
Brooklyn Edison, 8% com.	k152	149½	154½
Buffalo, Niagara & East. Pwr., pf.—25	l 25½	....	....
Buffalo, Niagara & East. Pwr., com.† —no par.	l 28½	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	94	89*	95*
California Ry. & Pwr., 7% pf.	105	88*	130*
Carolina Pwr. & Lt., pf.—$7—no par	f107½	107½	108
Central & S.W. Util., 7% pf.—no par	a 94½	93½	96½
Central & S.W. Util., pr. ln. $7 pf.—no par.	a100	98½	101½
Central Ariz. Lt. & Pwr., 7% pf.	94	....	....
Central Ark. Ry. & Lt., 7% pf.	101	99*	101*
Central Ill. Pub. Serv., 6% pf.	k 86	89*	91*
Central Ind. Pwr., 7% pf.	86	84½*	93½*
Central Pwr. Lt., 7% pf.	100	94*	103½*
Central States Elec., 7% pf.	95½	92½	95½
Central States Elec., com.†	m200	200*	230*
Century Elec., 6% com.	m117	110*	117*
Chicago Fuse Mfg., com.—$2.50 no par.	a 33	30	33
Cincinnati Gas & Elec., 5% com.	g 94½	....	....
Cities Service, 6% pf.	l 91½	91½	92½
Cities Service, pf. B—10.	l 8½	8½	8½
Cities Service, pf. BB—100.	l 82½	82	82½
Cities Service, com.—20.	l 57½	50½	57½
Cities Service, Bks. Shrs.—10.	l 28½	25	28½
Clarion River Pwr., 8% pf.	95	93*	95*
Cleveland Elec. Ilu., 6% pf.	108	103*	109*
Cleveland Elec. Illu., 10% com.	300	240*	310*
Colorado Pwr., 7% pf.	k 95	96*	97*
Columbia Gas & Elec., 6% pf.	101	99½	101½
Columbia G. & E. com. $5—no par.	84½	83½	91½
Columbia Ry., Gas & Elec., 6% pf.	94	65*	96*
Columbus Elec. & Pwr., 2d. pf.	106	....	....
Columbus Elec. & Pwr., 9% com.	55	....	....
Columbus Ry., Pwr. & Lt., 6% 1st pf.	98	98*	99½*
Columbus Ry., Pwr. & Lt., 6½% pf. B	106	....	....
Columbus Ry., P. & L., com.—no par	70	70*	85*
Commonwealth Edison, 8% com.	a140	....	....
Commonwealth Pwr., 6% pf.	93	91½	93½
Commonw'th Pwr., $2, com.—no par	44½	42½	45
Conn. Lt. & Pwr., 8% pf.	118	117*	121*
Conn. Lt. & Pwr., 7% pf.	112	108*	113*
Cons. Gas of N. Y., pf.†—50.	55	57*	62½*
Cons. Gas of N. Y., com $5—no par.	100½	99½	109½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	k105	102*	107*
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	e111½	111	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	e114½	113½	114½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	e126½	126	127
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par.	e 51½	51	52
Consolidated Pwr. & Lt., 7% pf.	106	100*	107*
Consumers Pwr., 6% pf.	100½	95*	101½*
Consumers Pwr., 6.6% pf.	104	101½*	106*
Continental Gas & Elec., 7% pfc. pf.	104½	96*	109½*
Continental Gas & Elec., 7% pr. pf.	101	95½*	101½*
Conti. G. & E. com. $4.40—no par.	k210	85*	210*
Crocker Wheeler, com.†	36	....	....
Crocker Wheeler, 7% pf.	84½	....	....
DALLAS PWR. & LT., 7% pf.	107	....	....
Dayton Pwr. & Lt., 6% pf.	101	95*	100*
Detroit Edison, 8% com.	135½	133½	136½
Dubilier Condenser, com.—no par.	k 3½	3½	4
Dubuque Elec., 6% pf.	102	93*	98½*
Duquesne Lt., 7% pf.	k115½	115½	116½
EASTERN NEW YORK UTIL., $7 pf.	102	80*	104*
Eastern New York Util. com.	65	70*	75*
Eastern States Pwr., $7, com.	11	12*	32½*
Eastern States Pwr., pf.	93	89*	95*
East. Tex. Elec., 7% pf.	106	100*	107*
East. Tex. Elec., com. $5—no par.	90	70*	80*
Edison Elec. of Boston, 12% com.	d223	218	229½
El Paso Elec., com. $5—no par.	70	70*	94*
El Paso Elec., 7% pf.	106	102*	106½*
Elec. Bond & Share, 6% pf.	f107	107½	109
Elec. Bd. & Sh. Sec., com. $1—no par	l 68	68½	72½
Electric Household Util.†	a 12½	11	14½
Elec. Investors, 6% pf.—no par.	92	87*	95*
Elec. Investors, com.†—no par.	33½	33	37
Elec. Investors, 10% pd. receipts.	20	12*	56*
Elec. Pwr. & Lt., ctfs. pf.	97½	96	97
Elec. Pwr. & Lt., ctfs., 40% pd.	k104½	103½	104½
Elec. Pwr. & Lt., ctfs. full pd.	k104	102½*	110½
Elec. Pwr. & Lt., ctfs., com.—no par.	17½	16½	18½
Elec. Refrig. cap.†	34½	32½	37½
Elec. Ry. Securities, com.—no par.	m 8	....	....
Elec. St. Battery com. $5.25—no par	74½	72½	79½
Elmira Wtr., Lt. & R.R., 7% pf.	100	97½*	101½*
Emerson Elec., pf.	m105	101*	105*
Empire Pwr., A $6.	27	26	27½
Engr. Pub. Serv., $7 pf.—no par.	m 99	93½	99
Engr. Pub. Serv., com. $7—no par.	24½	21½	24½
Eureka Vacuum Cleaner, com. $4—no par.	65½	60½	67½
FAIRBANKS MORSE, 7% pf.	k107	108	108½
F.-M., com.—$2.60—no par.	40½	39½	42½
Federal Lt. & Trac., com.†	38½	37½	42½
Federal Lt. & Trac., 5% pf.	94	92½	94
Ft. Worth Pwr. & Lt., 7% pf.	f108½	109	109
GALVESTON-HOUSTON ELEC. 6% pf.	70	65*	70*
Galveston-Hou. Elec., com.	28	....	....
Gen. Elec., 8% com.	83½	81	85½
Gen. Elec., special—10.	11½	11½	11½
Gen. Gas & Elec. (Del.) com. A. $1.50—no par	41½	41½	45
Gen. G. & E. (Del.) com. B—no par.	m 42	36*	48½*
Gen. G. & E. (Del.) pf. A. $8—no par.	k115	115	115½
Gen. G. & E. (Del.) pf. A $7—no par.	k102	100	107½
Gen G. & E. (Del.) pf. B $7.	k 97	96	98½
Gen. Pub. Serv., $7 pf.	k106½	106½	106½
Gen. Pub. Serv., com.	m 60	65*	80*
Ga. Lt., Pwr. & Rys., 6% pf.	89	82*	98*
Ga. Lt., Pwr., & Rys., com.	m 60	65*	80*
Ga. Ry. & Pwr., 8% pf.	k118	112*	122*
Ga. Ry. & Pwr., 7% pf.	106	100½*	108½*
Ga. Ry. & Pwr., 4% pf.	m119	....	....
Ga. Ry. & Pwr., 4% com.	120	....	....
Gt. Western Pwr., 7% pf.	h103	....	....
IDAHO PWR., 7% pf.	103½	103*	106*
Ill. No. Utilities, 6% pf.	k 88	88*	92*
Ill. Pwr. & Lt., 7% pf.	99½	96½	100½
Ingersoll Rand com. $8.	k 93½	92	95½
Int. Combus. Engr., com. $2—no par	46½	43½	49½
Int. Util., Class A—$3.50—no par.	k 29½	28	31
Int. Utilities, Class B—no par.	4	3	5½
Interstate Pwr., pf.—$7—no par.	92	90*	98*
Interstate Pub. Serv., 7% pf.	98½	96½*	99½*
Iowa Ry. & Lt., 7% pf.	96	98*	100*
JERSEY CENTRAL PWR. & LT., 7% pf.	97	94*	98½*
Jersey Cent. Pwr. & Lt., 7% pfc. pf.	110	95½*	112*
Jersey Cen. Pwr. & Lt., com.—no par	k 25	25*	50*
Johns-Manville, com.†—no par.	63½	55½	66

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, Feb. 5. lBid price Wednesday, Feb. 9. mLatest quotations available. *1926. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Feb. 8	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf.$7	k112	112¼	114½
Kansas Gas & Elec., 7% pf.	l103½	103	103½
Kentucky Hydro-Elec., 7% pf.	a 96	94½	96
Kentucky Sec.,6% pf.	k 83	75*	85*
Kentucky Sec., 5% com.	107	90*	108*
Kentucky Utilities, 6% pf.	95½	90*	96½*
Keystone Pwr. & Lt., 7% pf.	k97	95*	98½*
LACLEDE GAS LT., 8% com.	180	173¼	183¼
Lehigh Pwr. Sec., com.—no par.	16½	15½	18
Long Island Ltg., 7% pf.	107	....	....
Long Island Ltg., com. $2—no par.	140	120*	150*
Los Angeles Gas & Elec., 6% pf.	99	95½*	100*
Louisville Gas & Elec., cl. A. $1.75	25	23½	25
MAN. ELEC. SUPPLY, cap. $4.25 —no par	59½	53½	59½
Manila Elec., com.†—no par	k 44	40	44
Maytag Mfg., com. .50—no par	27½	23½	28
Memphis P. & L., pf.—$7—no par	107½	103*	110*
Metropolitan Ed., pf.—$6—no par.	95	91½*	98*
Metropolitan Ed., pf.—$7—no par.	103½	102*	108*
Metropolitan Ed., com. $5—no par.	60	45*	60*
Middle West Utilities, 7% pf.	a113½	105½	113½
Middle West Util., 7% pr. lien pf.	a119½	117½	119½
Middle West Util., com. $6—no par	a114	110	114½
Midland Utilities, pr. ln. 7% pf.	a102	98	100
Midland Utilities, 7% pf. A.	a 97	97	98
Milwaukee Elec. Ry. & Lt., 7% pf.	k101	100*	103*
Milwaukee Elec. Ry. & Lt., 6% pf.	k 98	87*	100*
Minn. Pwr. & Lt., 7% pf.	l105½	100	106
Miss. Pwr. & Lt., $8 pf.	107	102*	107½*
Miss. River Pwr., 6% pf.	96	93*	96*
Miss. River Pwr., com.	62	....	....
Mohawk Hudson Pwr., 1st pf.—$7 —no par	101	....	....
Mohawk Hudson Pwr., 2d pf.—$7 —no par	98	90*	102*
Mohawk Hudson Pwr., com.—no par	27	20½	27
Montana Pwr., 7% pf.	m118½	118½	118½
Montana Pwr., 4% com.	84½	81½	85
Montreal Pwr., 7½% com.	f 71½	....	....
Mountain States Pwr., 7% pf.	96	97*	102*
Mountain States pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	99	93*	101*
National Carbon, 8% pf.	m130	124*	130*
National Elec. Pwr., A†	24½	23½	25½
National Elec. Pwr., 7% pf.	a 96	93½	96
National Lt., Ht. & Pwr., com.	24	22*	25*
National, Light, Ht. & Pwr., 5% pf.	70	71*	73*
National Pwr. & Lt., pf.—$7—no par	102½	101½	103
National Pwr. & Lt., com.†—no par.	20	19½	22
National Pub. Serv., 7% pf.	a 93½	87½*	95*
National Pub. Serv., 7% ptc., pf.	113	96*	112*
National Pub. Serv., A com. $1.60— no par	20	18½	21½
National Pub. Serv., B com.—no par	k 15	14	16½
Nebraska Pwr., 7% pf.	l107½	107½	108½
Nevada-Calif. Elec., com.	m 26½	18½*	44½*
New Brunswick Pwr., 7% pf.	58	30*	60*
New Eng. Pub. Serv., pr. ln. pf. $7..	99½	98*	101*
New Eng. Pub. Serv., pf. $7.	94	95½*	97*
New Orleans Pub. Serv.—7% pf.	103	100*	105*
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	89*	95*
N. Y. Central Elec., 7% pf.	101	98*	100*
Newport News & Hampton Ry., Gas & Elec., 5% com.	109	98*	112*
Newport News & Hampton Ry., Gas & Elec., 7% pf.	109	98*	114*
Niagara Falls Pwr., 7% pf.—25.	28½	27½	29
Niagara, Lock. & Ont. Pwr., 7% pf.	l11	110*	111½*
No. Amer., 6% pf.—50.	50½	50	51½
No. Amer., com.—10.	47½	45½	49½
No. Amer. Edison, $6 pf.—no par.	99½	96½	100½
No. Caro. Pub. Serv., pf.—$7—no par	94	89*	96*
Northeastern Pwr., com.	17½	16½	18½
No. Indiana Gas & Elec., 7% pf. A.	102½	98*	103½*
No. N. Y. Utilities, 7% pf.	104	103*	105½*
No. Ohio Pwr., com.—no par.	k 11½	9½	12½
No. Ohio Trac. & Lt., 6% pf.	76	78*	81*
No. Ohio Trac. & Lt., 7% pf.	90	88*	96*
No. Ont. Lt. & Pwr., 6% pf.	k 87	75*	88½*
No. Ont. Lt. & Pwr., 4% com.	74	73*	78*
No. States Pwr., 7% pf.	102	....	....
No. States Pwr., 8% com.	112½	109½	113½
No. Texas Elec., 6% pf.	75	48*	65*
No. Texas Elec., 4% com.	34½	27	31
OHIO BRASS, com. B $4—no par.	76	70*	80*
Ohio Brass, 6% pf.	100	98*	101*
Ohio Gas & Elec., 7% pf.	94	90*	95*
Ohio Pwr., 6% pf.	98	90*	97*
Ohio Pub. Serv., 6% pf.	l95	94½	95
Ohio Pub. Serv., 7% pf.	l105	103½	105
Ohio River Edison, 7% pf.	103	98½*	105*
Oklahoma Gas & Elec., pf.	96	....	....
PACIFIC GAS & ELEC., 6% pf.	25	....	....
Pacific Gas & Elec., 8% new com.	32	31½	33
Pacific Pwr. & Lt., 7% pf.	l102½	102½	102½
Parr Shoals Pwr., 6% pf.	92	90*	97½*
Penn Cent. Lt. & Pwr., $5 pf.—no par	c 73	71½	73
Penn-Ohio Edison, 7% pf.	98	....	....
Penn-Ohio Elec., 7% pf.	98	93*	96*
Penn-Ohio Pwr. & Lt., 7% pf.	98	94*	100*
Penn-Ohio Pwr. & Lt., 8% pf.	109	100*	111*
Penn Pwr. & Lt.—$7—no par.	l108½	105½	106½
Penn Pub. Serv., 6% pf.	90	85*	90*
Penn Wtr. & Pwr., 8% com.	179½	175½	181
Phila. Co., 6% pf.—50.	k 51	50	51
Phila. Co., com.—50.	88	85½	88
Phila. Elec., 8% com.—25.	c 52	49½	54
Pittsburgh Utilities, 7% pf.—10.	18½	18	18½
Portland Elec. Pwr., 7% pf.	97½	97*	101½
Portland Elec. Pwr., 6% pf.	81	71*	87*
Portland Elec. Pwr., 6% 2d pf.	67	71*	75*
Portland Elec. Pwr., com.	30	26*	48*
Potomac Elec. Pwr., pf.	l109½	....	....
Pwr. Corp. of N. Y., com. $1—no par	m79	77½*	90½*
Pwr. Sec., pf.—no par.	k 30	10*	39*
Pwr. Sec., com.—no par.	k 5	4*	13*
Public Serv. of Colorado, 7% pf.	l 99	99	99
Pub. Serv. of N. J., 7% pf.	109½	108½	110½
Pub. Serv. of N. J., 8% pf.	k125½	125	126
P. S. of N. J., $5 com.—no par.	34	32	35
Pub. Serv. of No. Ill., 6% pf.	a104	102	104
Public Serv. of No. Ill., 7% pf.	a115½	113½	114
P. S. of No. Ill., com. $8—no par.	a136	130½	136
Pub. Serv. of No. Ill., 8% com.	a136	132	136
Pub. Serv. of Okla., 7% pf.	99	92*	100*
Pub. Serv. Elec. & Gas, 6% pf.	103	102	103½
Pub. Serv. Elec. Pwr., 7% pf.	k114½	113½	114½
Puget Sound Pwr. & Lt., 7% pf.	105	103*	108*
Puget Sound Pwr. & Lt., 6% pf.	84	82*	84½*
Puget Sound Pwr. & Lt., com.	31½	30½	33½
RADIO CORP. OF AMER., pf.—50.	52	50½	52½
Radio Corp. of Amer., com.—no par.	51½	47½	54½
Republic Ry. & Lt., pf.	k115	95*	120*
Republic Ry. & Lt., com.	117	75*	116*
Rochester Gas & Elec., 6% pf. C.	105½	....	....
Rochester Gas & Elec. 6% pf. D.	k 102½	98*	102½
Rochester Gas & Elec., 7% pf.	105½	105*	107*
SAFETY CABLE, com. $4.	55½	52½	56½
San Joaquin Lt. & Pwr., 7% pf.	106	97½*	108*
St. Joseph Ry., L., H. & P., 5% pf.	70	60*	70*
Servel Corp.	9½	7½	9½
Sierra Pacific Elec., com.	24	....	....
Sioux City Gas & Elec., 7% pf.	100	96*	101½*
Southeastern Pwr. & Lt., pf.—$7 no par.	l101½	97*	103*
Southeastern Pwr. & Lt., $6 ptc. pf.	l 67½	....	....
Southeastern Pwr. & Lt., com.—no par.	31½	30	32½
So. Calif. Edison, 8% pf.	36½	32½*	36*
So. Calif. Edison, 7% pf.	27½	....	....
So. Calif. Edison, 6% pf.	k 24½	24½*	25*
So. Calif. Edison, 8% com.	33	31½	34½
Southern Cities Utilities, 7% pf.	79	....	....
Southern Cities Utilities, com. $4.	23	..	....
Southwestern Lt. & Pwr., A $3.	63	52*	60*
Southwestern Lt. & Pwr., B.	60	38*	55*
Southwestern Lt. & Pwr., $6 pf.	85	78*	82*
Southwestern Pwr. & Lt., 7% pf.	k105	100*	105*
Springfield (Mo.) Ry. & Lt., 7% pf.	97	95*	100*
Standard Gas & Elec., 8% pf.	58½	57½	58½
Standard Gas & Elec., 7% pf.	105	....	....
Standard G. & E., com. $3—no par.	54½	54	55½
Standard Pwr. & Lt., 7% pf.	96	90*	98½*
Staten Island Edison, pf.—$6—no par.	98	93*	97½*
Superheater, $6 com.—no par.	167	138*	173*
Syracuse Lighting, 7% pf.	102	105*	107*
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, 8% com.	300	260*	355*
TAMPA ELEC., com. $2.	61½	49	62½
Tenn. Elec. Pwr., 6% pf.	92	87*	90*
Tenn. Elec. Pwr., 7% pf.	104	98*	105*
Terre Haute, Ind. & East. Trac., 5% pf.	20	20*	37*
Terre Haute, Ind. & East. Trac., com	1	1*	7*
Tex. Pwr. & Lt., 7% pf.	l106½	107	109
Tide Water Pwr., 8% pf.	105	101*	106*
Timken Roller Bear., com.—$4 no par.	91½	78	94
Toledo Edison, 8% pf.	l115	114	115
Toledo Edison, 7% pf.	l105	104	105½
Toledo Edison, 6% pf.	l 95	94½	95
Toledo Edison, 6% com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	90	87½*	90*
UNITED GAS & ELEC., 6% pf.	99	94*	97*
United Gas & Elec., com.—no par.	m57	56*	66*
United Gas & Elec. (N. J.) 5% pf.	70	70*	75*
United Gas Impr., 8% com.—50.	c 90½	89½	93½
United Lt. & Pwr., pf.—$4—no par.	50	44*	53*
United Lt. & Pwr., pf.—$6.50—no par.	92	87	92
United L. & P., com. A .48—no par.	13½	13½	15½
United L. & P., com. B .48—no par.	k 16	13	29
Utah Pwr. & Lt., 7% pf.	l105½	103½	104½
Utica Gas & Elec., 7% pf.	105	103*	106*
Utica Gas & Elec., 8% com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	93	92*	98*
Utilities Pwr. & Lt., com. A $2.	28	27	29½
Utilities Pwr. & Lt., com. B $1—no par.	14½	13½	14½
VERMONT HYDRO-ELEC., 7% pf.	95½	94*	96*
Virginia Elec. & Pwr., 7% pf.	105	101*	105*
Virginian Pwr., 7% pf.	108	102*	104*
Virginian Pwr., com.	70	65*	75*
WAGNER ELEC., 7% pf.	b 71	70	74
Wagner Elec., com.†—no par.	b 20½	18½	24
Washington Ry. & Elec., 5% com.	l180	....	....
Washington Ry. & Elec., 5% pf.	f 91	....	....
Washington Wtr. Pwr., 8% com.	190	130*	138*
West Mo. Pwr., 7% pf.	m92	....	....
West Penn Elec., 7% pf.	106	102	107½
West Penn Elec., Cl. A $7.	103	97½	103
West Penn Pwr., 7% pf.	113	111	114
West Penn Pwr., 6% pf.	102½	100½	103
West Virginia Lt., Ht. & Pwr., 7% pf.	94½	95*	98*
West Va. Utilities, 7% pf.—50.	48½	43*	51*
Western Pwr., 7% pf.	99½	98	101
Western States Gas & Elec., 7% pf.	92	89*	94½*
Western States Gas & Elec., com.	16	....	....
Westinghouse Elec. & Mfg., 8% com. —50.	69½	67½	70½
Weston Elec. Instrument, Cl. A $2.01 —no par.	k 33	30½	34½
Weston Elec. Instrument, com.—no par.	16½	15	17½
Wheeling Elec., 6% pf.	95	91*	97*
Wis. Pwr., Lt. & Ht., 7% pf.	k 95	85*	91*
Worthington Pump, 7% pf. A.	50	46	50
Worthington Pump, 6% B.	43½	40½	43½
Worthington Pump, com.	27	20½	27
YALE & TOWNE com. $5—25.	73½	70½	73½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Franisco; iPittsburgh; jWashington. kBid price Saturday, Feb. 5. lBid price Wednesday, Feb. 9. mLatest quotations available. *1926. †Dividend rate variable.

New Capital Issues

New financing by electric light and power companies during the second week of February continued active. One of the largest offerings was that made by the Standard Power & Light Corporation in the form of 6 per cent gold debentures, an issue involving a total of $24,000,000. These debentures, dated Feb. 1, 1927, and maturing Feb. 1, 1957, were priced at 99½ and interest, to yield over 6.03 per cent. Proceeds from the sale of $10,000,000 of this offering, together with treasury cash, will be used to retire $10,000,000 two-year 5 per cent first lien gold notes of the Pittsburgh Utilities Corporation, due April 15, 1928, heretofore assumed by Standard Power & Light Corporation. The remaining $14,000,000 will be used to refund $14,000,000 debentures of the corporation now outstanding, thus effecting a consolidation of the corporation's funded debt.

Another sizable loan was floated by the Los Angeles Gas & Electric Corporation—an issue of first and general mortgage gold bonds, series of 5's, a piece of financing amounting to $10,000,000. The proceeds of these bonds, priced at 98½ and accrued interest, will be used for the purpose of redeeming all of the outstanding series "B" 7 per cent and series "C" 7 per cent general and refunding mortgage bonds of the corporation, aggregating $5,000,000 principal amount; to retire 5½ per cent general and refunding mortgage bonds, series I, amounting to $1,895,500, and for extensions, additions and improvements to the corporation's plants and systems.

With the purpose of retiring all outstanding bonds (bearing interest rates higher than 5 per cent), except a small amount of divisional bonds, of reimbursing its treasury for construction expenditures and of providing an adequate medium for future financing, the Northwestern Public Service Company issued first mortgage gold bonds, series A, totaling $5,800,000. These 5 per cent bonds, dated Jan. 1, 1927, and maturing Jan. 1, 1957, were priced at 96½ and accrued interest, to yield about 5.25 per cent.

The North Continent Utilities Corporation offered 6½ per cent convertible sinking fund gold debenture bonds, series A, to the amount of $2,000,000, the price being 100 and interest. The North Continent corporation controls a number of gas and electric companies, serving a total population of approximately 150,000. The management of the corporation and its subsidiary properties is in the hands of the William A. Baehr organization.

Toward the close of the week under review the Associated Gas & Electric Company issued 5½ per cent convertible gold debentures to the amount of $40,000,000, the price being 95⅞ and interest, yielding over 5.75 per cent. More

than $20,000,000 of the proceeds will be used to simplify further the capital structure of the system and the balance to acquire additional public utility properties or securities deriving their income from such properties.

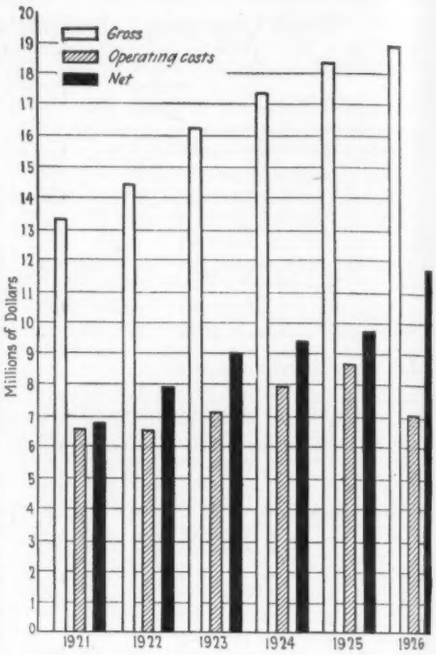
First mortgage 6½ per cent gold bonds of the Southwest Public Service Company were offered to the amount of $900,000 at 99½ and interest.

Stock Split-Up Approved. — The United Electric Light Company, Springfield, Mass., approved at a stockholders meeting on Feb. 3 the stock split-up as proposed by directors of the company in December. Each stockholder will receive four shares at $25 for each share, $100 par, now held. By the change the par value becomes $25 and the number of shares is increased from 40,000 to 160,000. Approval of the Public Utilities Commission and a second approval by stockholders is necessary before the change can be made. At the annual meeting the following officers and directors were re-elected: Treasurer and secretary, Joseph F. Lyons; assistant treasurer, James Gray; directors, Walter Mulligan, Alfred Leeds, William O. Day, Charles L. Long, William C. Godfrey, Charles C. McElwain, Lorenzo J. Scott and Edwin A. Carter. Following the general election directors met and formally elected President Walter J. Mulligan and Vice-president Alfred Leeds.

New Company Organized by Victor Emanuel

Victor Emanuel, who resigned as chairman of the board of directors of the National Electric Power Company, when that organization was acquired last year by the Insull interests, has formed a new company known as the United States Electric Power Corporation, which, through a subsidiary, has already acquired small utility properties in the State of Washington.

Recent advices from Albany are to the effect that the United States Electric Power Corporation had applied for permission to increase its capital from 100,000 shares of no par or nominal value to 800,000 shares. The new capitalization will consist of 150,000 shares of prior preference preferred, 150,000 shares of preferred and 500,000 shares of common.



OPERATING COSTS SHOW SLIGHT REDUCTION AS EARNINGS INCREASE

Montreal Power Expands Its Business

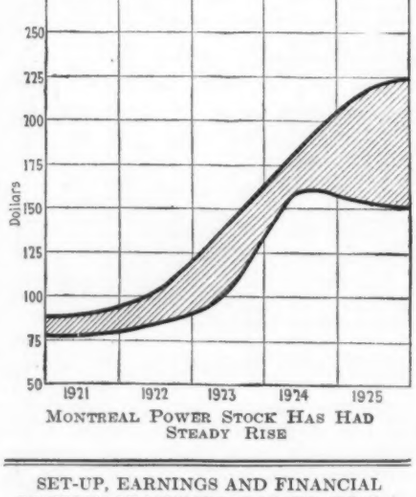
Growth in Gross Earnings Only Marginal, but Net Revenue Is Up 10 per Cent

A DECLINE of more than $300,000 in the operating costs and taxes of Montreal Light, Heat & Power Consolidated is a factor in the 10 per cent growth in net revenue. Taxes and costs of material and labor are still abnormally high, but the trend is encouraging and a rate reduction in gas was found possible during the year.

Two important changes took place during the year in the capital set-up of the company. It was decided to take advantage of the favorable bond market, and the company sold $30,000,000 of first refunding and collateral trust bonds under a seventy-five-million-dollar mortgage. The funds were secured at 5 per cent and used to retire the company's 6 per cent preference stock. Then the shares of the company were divided into one redeemable preference share of $50 par value and three no-par common shares. The preference shares, as already indicated, were later sold.

As shown in the tabular analysis, the company had no funded debt preceding the thirty-million-dollar issue, and at present its indebtedness is only 31 per cent of capitalization. Gross revenue is 19 per cent of capitalization against 25 per cent last year, the change, of course, being due merely to the change in capital structure.

The remarkable returns on Montreal Power stock over a period of years are well known, and the position of the company seems better than reflected by any previous report. The operating ratio has been further reduced from 47 to 44 per cent. Revenue is one-fifth of total assets, and net earnings are 45 per cent of revenue against 43 per cent last year. Bond interest was earned five and two-fifths times in 1926—a record which is far above the average. Gross earnings over a period have grown more rapidly than have those of the entire industry. The amount of funded debt per dollar of net earnings is only $3.45, against an average for all United States companies of $4.80. Montreal has shown a rapid growth during recent years, and Montreal Power is benefiting both in domestic and industrial business. New territory, moreover, is being opened up, and the outlook for growth is one which is not exceeded in many centers on the American continent.



MONTREAL POWER STOCK HAS HAD STEADY RISE

SET-UP, EARNINGS AND FINANCIAL POSITION OF MONTREAL LIGHT, HEAT & POWER CONSOLIDATED

	1926	1925
1. Financial Set-up (Dec.):		
Ratio debt to capitalization	31%	No debt
Ratio gross revenue to capitalization	19%	25
Ratio gross to funded debt	63%	No debt
2. Revenue Record:		
Ratio operating costs to gross	44%	47%
Ratio revenue to total assets	20%	20%
Ratio net earnings to revenue	45%	43%
Times bond interest earned	5⅔	
Dividend earned	$10.95*	10.32
Debt per dollar net	$3.45	No debt
Earnings compared with whole industry—Exceeds growth of whole industry.		
3. Investment Factors:		
Size of gross	$18,907,382	$18,348,806
Size of net income	7,082,567	6,676,376
Is mortgage modern? Series—modern type.		

*On old basis.

Company Reports

The following statements of earnings have been issued by electric light and power companies:

Name of Company	Gross Earnings Twelve Months Ended Dec. 31. 1926	1925
Brazilian Trac., Lt. & Pwr.	$38,602,891	$31,243,760
Cities Service	25,438,363	19,764,976
Federal Light & Traction	*6,547,496	*5,877,884
Jamaica Public Service	650,149	619,080
Milwaukee Elec. Ry. & Lt.	26,555,000	23,992,653
Pacific Gas & Electric	51,125,990	48,066,897
People's Light & Power	1,676,670	1,555,578
United Elec. Lt. (Mass.)	3,231,158	3,180,569
United Gas Improvement	10,320,578	9,955,285
Washington Water Power	6,050,686	5,807,432
West Penn Electric	34,437,010	31,427,134
Winnipeg Electric	5,449,493	5,165,228

* Twelve months ended Nov. 30.

Doherty Offices Moved in Boston.—Henry L. Doherty & Company announce the removal of their New England offices from the National Shawmut Bank Building to 100 Milk Street, Boston, effective Feb. 1.

New England Power Stockholders Approve Acquisition of New Properties.—Stockholders of the New England Power Association voted to approve acquisition of control of the Narragansett Electric Lighting Company and the United Electric Railways through ownership of voting stock of the Rhode Island Public Service Company.

Manufacturing and Markets

What's Wrong with the Motor Industry?

Merchandising Ability and Real Leadership Needed if This Branch of Business Is to Prosper—Present Commercial Policies Sadly Need Revision

MOTOR manufacturers are not by any means the only people who think their business has all the grief and their friends' business all the glorious profits; but when customers, men in other branches of the same industry and leading bankers agree that there is something wrong, there must be some foundation for the complaints. The electric motor has become essential to industry and the business is growing. Despite this, motor manufacturers have complained for years that they have not made what would be considered a fair profit in other lines of business. They contend, too, that the growth of the business has not materially improved their financial position and that in some cases profits have been less and losses more with the increased sales. This may be owing in some measure to increasing manufacturing capacity too rapidly, but that does not seem to be the major trouble. It is more deep-seated than that, and it appears to be not so much a question of "What is the matter with the motor business?" as it is "What is the matter with motor manufacturers?"

Merchandising Ability Needed

The electric motor business was created and brought to its present state of development by engineers. The control of the business is still largely in the hands of engineers, though some of them are very far removed from the engineering details. They have shown themselves to be good designers and builders, and as long as it was an engineering business they made good progress. Now that the business has developed to the point where mass production and intensive merchandising are essential, they are not so successful, and changes in policies or executive personnel, or both, may be necessary in order to meet present-day conditions. Changes in policies should be sufficient to insure making large quantities of a few varieties instead of a few of many varieties, but new blood and constructive leadership may be required to develop the business along sound commercial lines. The manufacturers admit that the commercial situation today is deplorable and that they are all to blame—except one. Which one? Ask any motor manufacturer that question and he will be the blameless one. All others will be wrong.

A Suicidal Policy

Some are afraid that competitors are trying to put them out of business, but these are fears, not facts. Bankers say it should be obvious that unless each one does his share toward correcting the poor business practices of today, only those who are strong financially can be expected to keep out of the sheriff's hands. They have walked into a deep hole with their eyes open, and too many are not only blaming some one else for pushing them in but are also criticising their competitors for not pulling them out. But that is too much for anybody to expect. A manufacturer who is conducting an unprofitable business must either get it on a profitable basis or get out altogether. If every company would take definite steps to conduct his business on sound business principles, business would be better for everybody. One of the principal troubles now is that manufacturers, who should be correcting the mistakes which experience and a scrutiny of their own policies would show, are wasting their time and energies talking about the shortcomings of their competitors.

A Typical Example

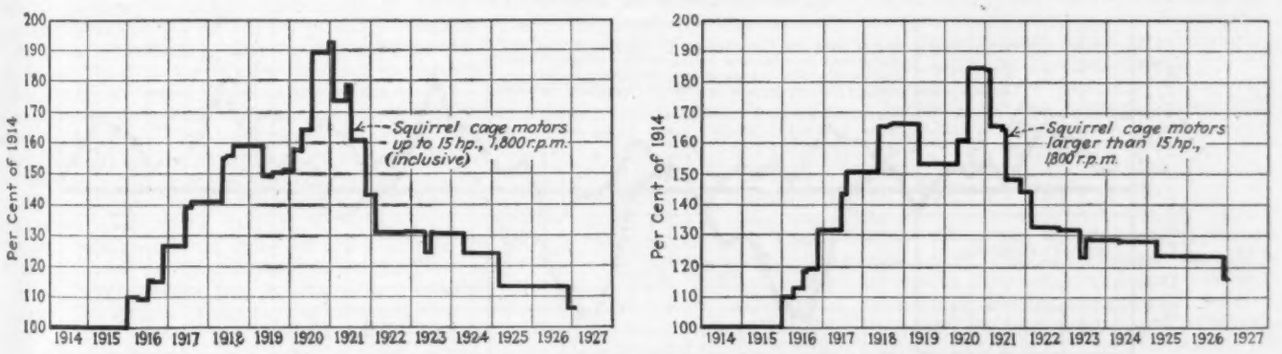
Perhaps the commercial situation can be best illustrated by an actual example of some of the methods of buying and selling motors in vogue today. A and B are selling a motor in quantities at $20 each to manufacturers of a certain device. C, who has been unable to get the business because his motor did not come up to the requirements or for some other reason, decided to quote A's cutomer X a price of $18, though he knew he could not get the business and that the only result would be a demand on A to meet C's price. Through a typographical error a quotation of $16 was made, but later corrected. The X company's purchasing agent showed the sixteen-dollar quotation to A, telling him he would like to give him the business because his product had a good record, but that C was a company with a high standing in the industry and could be relied upon to make its product good. Even if a few motors did give trouble, he said, this would be a small matter compared with the saving of $4 each on the large number of motors used during the year. The purchasing agent said he wanted to explain everything to A before he placed the order so that A might know why he lost the business.

Every purchasing agent will recognize this standard story and, like every motor manufacturer, will know without being told that A took the business at $16, even though it eliminated his profit entirely. It never occurred to A to ask C whether he really quoted a price of $16, nor to insist that X pay him a profit on the business, even if that made his price higher than C's. X would not have used C's motor, but naturally he did not want to pay A a premium unless he was forced to do so by the seller.

A Vicious Circle

The Y company's purchasing agent, who buys a similar motor from both A and B, heard of the accomplishment of his brother purchasing agent and accused A of charging him too high a price. Under threat of having the order canceled, A reduced the price from $20 to $16 on an order he had already received during the previous week. There was no more reason for

(Continued on page 381)



AVERAGE PERCENTAGE PRICE LEVELS OF SQUIRREL CAGE MOTOR RATINGS

Production Upward

January Operations 4.4 Per Cent Over Those of December, but 5 Per Cent Under the Month of January Last Year

AMERICAN manufacturing plants taken as a whole opened the new year with the usual seasonal increase in productive operations. Both November and December witnessed material recessions in the industrial productive operations of the nation, but preliminary figures available for January indicate that this downward trend ended with December and that January operations were about 4.4 per cent over December. This is about the normal increase in general production to be expected at this season of the year, based upon productive operations of past years. A significant fact, however, is that the January industrial production was about 5 per cent under that of January last year and December productive operations were about 5 per cent under December, 1925. The year 1927, therefore, opened with apparently normal increased operations over December, but with general industrial production on a slightly lower plane than was witnessed during the opening months of 1926. This industrial situation would seem to bear out the opinions expressed by industrialists in general that 1927 industrial production will be slightly under that of 1926. Such is the picture of general industrial operations in the nation as a whole as indicated by reports received by the ELECTRICAL WORLD on the consumption of energy by the manufacturing plants of the nation—plants consuming more than nine billion kilowatt-hours per annum.

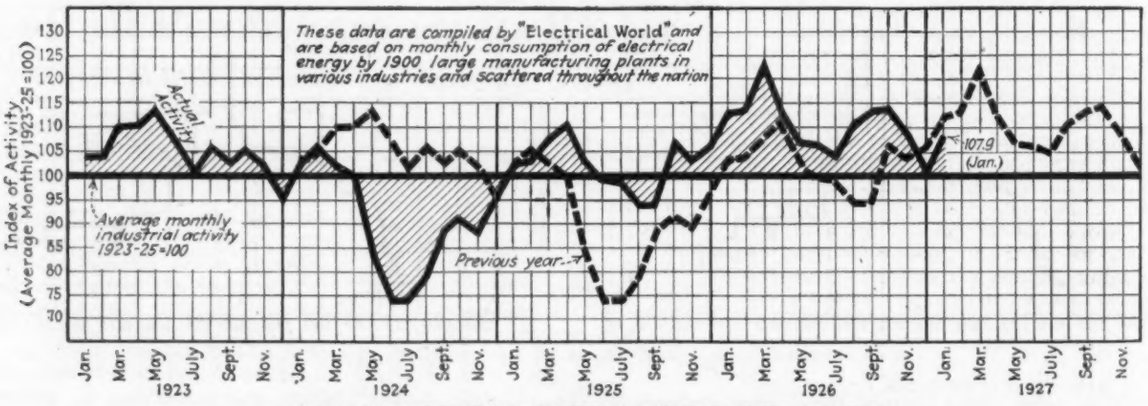
Production in the metal industries taken as a whole appears to have silghtly exceeded that during December. Operations in the rolling mills and iron and steel plants were about 3.6 per cent above those of December, but the ferrous and non-ferrous metal-working plants taken as a whole reported a slight drop in operations from December. The productive operations of the metal industries, however, taken as a whole, were about 11.5 per cent under those of January, 1926. This would seem to indicate that the metal industries will not this year witness the record operations which were reported during the late winter and early spring months of last year.

The automobile industry was unquestionably on the up grade after the drastic slump in production reported during December. Incomplete figures indicate that the January automobile production will exceed that of December by about 45 per cent.

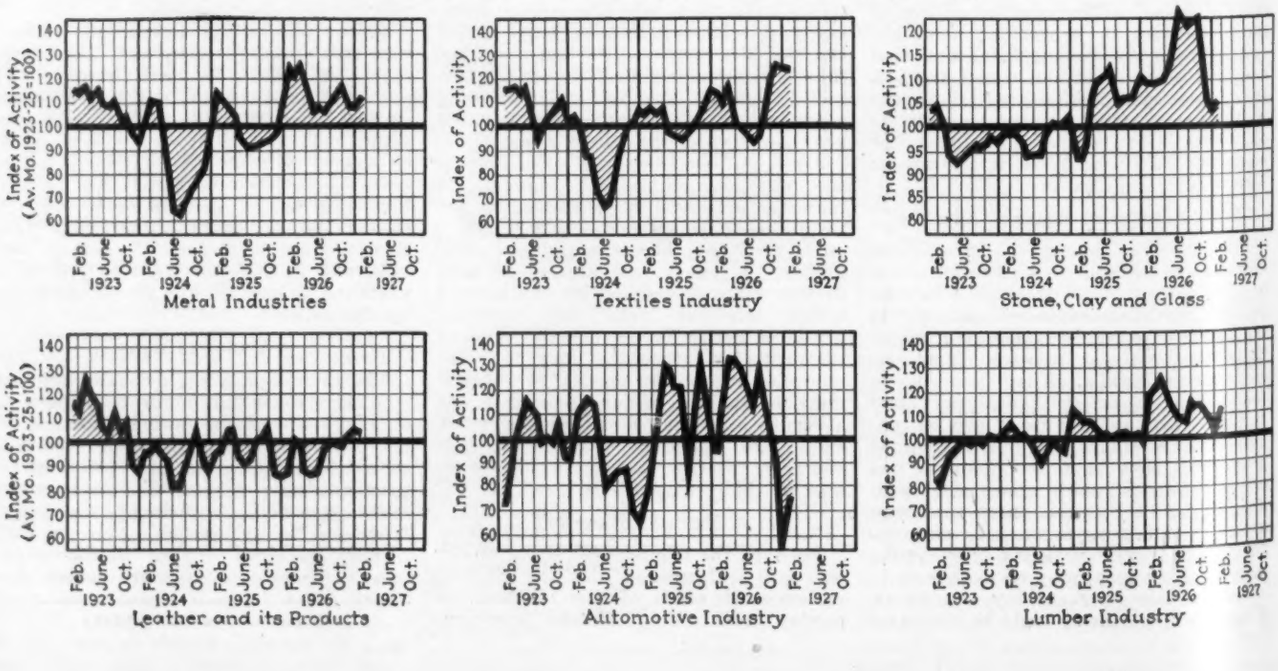
Electrical energy consumption by the textile plants during January indicates that this industry is producing at about the same level as in December, but at about 7 per cent above the operations reported for January last year. The lumber industry reported materially increased operations over December, which increased production is seasonal in character. The January production, however, was about 7.5 per cent under that of January last year, thereby reflecting the probable decrease in residential construction during the present year.

"Electrical World" Barometer of Industrial Activity in the United States as a Whole

(Data Unadjusted for Seasonal Variation)


These data are compiled by "Electrical World" and are based on monthly consumption of electrical energy by 1900 large manufacturing plants in various industries and scattered throughout the nation
Index of Activity (Average Monthly 1923-25=100)
Actual Activity
Average monthly industrial activity 1923-25=100
Previous year
107.9 (Jan.)
Jan. Mar. May July Sept. Nov.
1923 1924 1925 1926 1927

GENERAL INDUSTRIAL ACTIVITY IN THE UNITED STATES



What's Wrong with the Motor Industry?

(*Continued from page 379*)

supplying these motors at $16 to Y than to X, but presumably A thought it was better to be consistent than right. Y's purchasing agent told B that A voluntarily reduced the price of an order he had received the week before. The purchasing agent said this greatly embarrassed him and made it appear to his superiors that he was a very poor purchasing agent. He said he knew that B would not do such a trick, but of course if B wanted any more business he must take it at $16 also, which he did regardless of his cost. B told all his friends what a fool A was for making a voluntary cut when he did not have to make one, but it never occurred to him to question the purchasing agent's story and to ask A whether he really did such a thing.

Purchasing agents are criticised for misrepresentation, but if the motor manufacturer does not know the value of his product, it is not the function of the purchasing agent to maintain the price for him. Purchasing agents consider the initial bid on a motor order of any size simply a starting place from which to begin bargaining for a lower price just because the motor manufacturers have taught them to do so. A motor manufacturer's own purchasing agent in buying from a manufacturer in another branch of the industry forced the seller down by misrepresenting the price at which he could buy the device elsewhere. When the purchasing agent was found out, however, the seller returned the order because of the misrepresentation and refused to accept it. It will be a red-letter day in the history of motor manufacturers when they emulate this example, though the shock may play havoc with those of their customers who have weak hearts.

A Peculiar Situation

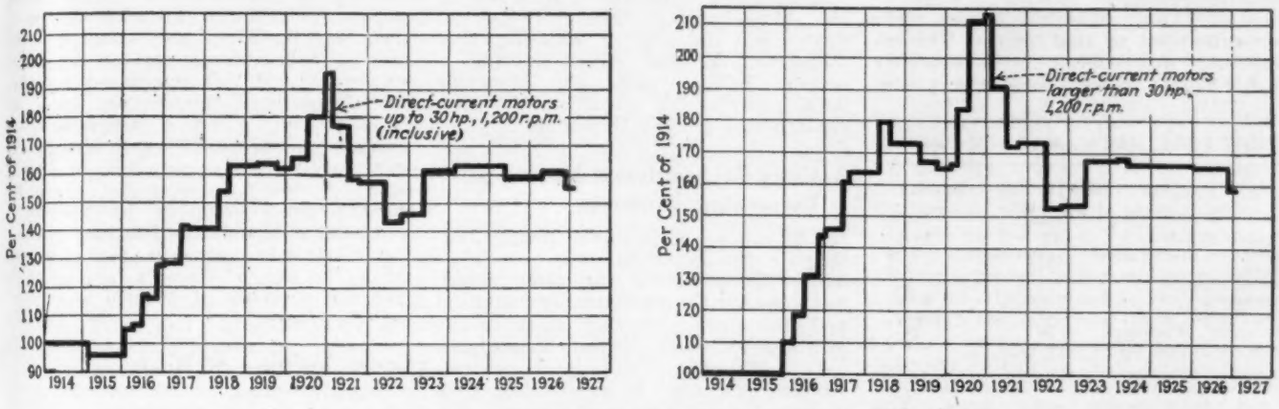
Purchasing agents have brought motor manufacturers to the point where each one thinks he is the only one trying to make a profit and that all his competitors are vying with each other to see who can make the lowest price. As long as the motor manufacturers can be kept in this frame of mind the purchasing agents can have pretty much their own way. When the motor manufacturers trust their competitors in preference to purchasing agents, there will be a different story to tell. They will learn that their competitors are just as anxious to make a profit as they are; then misrepresentation of motor prices will cease and motors will be sold at a profit. There is a question, however, as to whether present motor manufacturers can make this change, or whether transfusion from other industries will be necessary before the desired results can be accomplished.

Question of Personnel

Many motor manufacturers pay sales managers less than good salesmen earn even in other branches of the electrical industry, and both the sales managers and the salesmen in question are getting only what they are worth. Motor manufacturers say they cannot afford to pay the salaries paid in other industries, but some day they will learn that cheap executives are the most expensive men in the world. Capable commercial executives, such as motor manufacturers might use to advantage, are earning considerably more than some motor company presidents who should hire them, but the right man, regardless of salary, would pay for himself many times over if some real authority were given him.

Bankers who have been watching the industry say that if the engineers and others who are trying to run the motor companies cannot make a success, they should step aside and let real merchants run the business, or else "quit kicking." The consolidation of companies into larger units has been the order of the day except in the electrical manufacturing industry. Bankers have seen the possibilities of consolidation in this industry, but the manufacturers have not been willing to co-operate; consequently the lack of economies which could have been effected is still reducing their profits.

Leaders in the central-station and manufacturing industries would all like to see the motor manufacturers prosper and have money to develop new lines and improve their product. It is claimed, however, that this is something which the motor manufacturers must work out for themselves. The trouble is they have no leader—no one to show by continuous example how to eliminate the bad commercial practices and put the sale of electric motors on a sound, sane basis. The smaller manufacturers do not feel that they are strong enough to assume such a position of leadership, and so far the larger companies have not done so either.


Per Cent of 1914
Direct-current motors up to 30 hp., 1,200 r.p.m. (inclusive)
Direct-current motors larger than 30 hp., 1,200 r.p.m.
1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927

AVERAGE PERCENTAGE PRICE LEVELS OF DIRECT-CURRENT MOTOR RATINGS

Business Conditions

ORDERS placed for electrical equipment in the last ten days have brought the volume of business to a higher level. Sales during January were comparatively small but a large number of negotiations were under way. Motor sales are steady and industrial equipment orders are gaining. An automobile manufacturer placed an order for a large number of ball-bearing motors. Machine tool and small machinery manufacturers are also active buyers of motors. Substation apparatus is in active demand, and an order was placed by the city of Seattle for $81,000 worth of such equipment. Many street-lighting projects are also reported. Central-station buying is in general active and one company in the Middle West is placing orders at the rate of $140,000 per day.

In New England sales are in steady volume and industrial equipment orders have gained in volume. Several motor orders were placed by manufacturers of machine tools, grinding equipment and small machinery. Substation apparatus is in demand in the New York district and both sales and inquiries are brisk. In the Southeast sales were active and with an increasing number of inquiries a steady volume of business is assured. Orders for elevator equipment are in satisfactory volume. Sales are active in the St. Louis district and the outlook is good. A large volume of business was transacted in the Middle West and central-station companies were active buyers. Wiring devices and conduit were in strong de-

mand. On the Pacific Coast power company buying was brisk, especially for poles and pole line hardware. Many street-lighting and hospital jobs are under way or projected.

Copper Price Decreases—Lead Sells in Good Volume

Copper sales have been reported at as low as 12⅛ cents, delivered, although buying at this level was not large. Leading producers adhered to a quotation of 12.62½ cents but buyers were not interested at that figure. The export price was reduced but the tendency is for sellers to wait for better prices.

NEW YORK METAL MARKET PRICES

	Feb. 2, 1927 Cents per Pound	Feb. 9, 1927 Cents per Pound
Copper electrolytic	13	12.62½
Lead, Am. S. & R. price	7.40	7.40
Antimony	14⅜	15½
Nickel, ingot	35	35
Zinc spots	6.925	6.95
Tin, Straits	67	69⅜
Aluminum, 99 per cent.	26	26

Base copper price Feb. 9, 1927, 14½ cents.

Lead sales were fairly large. The American Smelting & Refining Company continues its official contract price at 7.40 cents. Zinc offers were shaded but consumers were not interested. Prices soared in the domestic tin market on Tuesday but some of the offers made were not absorbed at the end of the day.

Substation Apparatus in Demand in New York District

Substation apparatus and transformers are in good demand in the New York district, both sales and inquiries being brisk. In other lines inquiries are being received in good volume but sales are slow. Some orders for switching equipment are reported, but general buying in this line is poor. There is some improvement in the demand for poles and crossarms and line hardware sales are slightly more active. An improvement is reported in orders for motors for general industrial uses, and the demand for motors of from 10 hp. to 50 hp. is increasing. There is a good market for control apparatus, particularly of the automatic type, and although individual orders are small the total volume is good.

Sales in New England District in Steady Volume

Industrial equipment orders have gained in number in the New England district, and small motor sales continue steady with one manufacturer reporting a number of orders for lots ranging from one hundred to two hundred units.

Increased activity among the manufacturers of machine tools, grinding equipment and small machinery is reported to have been reflected favorably in small motor sales. Heavier equipment is also attracting interest, and turbo-generator activity has increased both in number of sales and also in the volume of negotiations. Of interest in this connection may be cited orders recently received in this district for two 1,000-kw. units with accessories and another of 750-kw. capacity. The latter order covers equipment for a new plant development.

Industrial electric heating is active and a number of sales recorded by a Rhode Island manufacturer are of interest. Recently two small furnaces were added to one plant, making a total of twelve now in use, and two hardening furnaces were also purchased by the same manufacturer. Prominent buyers are the jewelry manufacturing industries. Electric street lighting is active. Jobbing sales are favorable with inquiries for quotations for new construction gaining in volume.

Activity in Southeast Presages Increasing Business

The volume of business during January in the Southeast was somewhat under the total for the same month last year but the considerably increased activities during the last week of the month gave promise of increasing business. Manufacturers report central-station purchases in reasonably good volume for current requirements but no outstanding single orders were received. A large power company announces the closing of a power contract with a 100,000 spindle mill, 40,000 spindles being new construction, and this will involve the construction of an 18-mile high-tension line, the installation of a 6,000-kw. high-tension transformer bank besides the motors and electrical construction materials for the new mill. A contractor reports closing two electrification contracts, one calling for $20,000 worth of electrical equipment and the other, $10,000. There is a considerable amount of this work pending.

Elevator equipment activities are in satisfactory volume, two of the largest single orders received being for an installation worth $75,000 in Chattanooga and a job in Atlanta valued at $35,000. One of the largest elevator manufacturers states that his January sales volume was a little better than normal with 25 per cent of the total business for the Southeast coming from the Birmingham section. Jobbers sales show an improvement.

Power Company Buying Brisk on Pacific Coast

Power company buying on the Pacific Coast is brisk especially for pole line hardware and poles. Orders covered two carloads of 7-in. top 30-ft. poles and four carloads of 35-ft. and 40-ft. poles, all of which were used in the Lodi and Monterey districts. Power apparatus and machinery orders virtually have been limited to stock material. Pumping motors are apparently due for another good year owing to the decreased snowfall. A substation worth $3,500 for Mt. View and eight quadruple motored railway car units for Honolulu, amounting to about $40,000, are outstanding orders. Street lighting and hospital jobs are prominent. Quotations are now being furnished on a street-lighting job for Willows and another for Willits, each amounting to $10,000 and one for Stockton worth $45,000. Contracts for the St. Mary and St. Joseph hospitals of San Francisco, where the electrical work averages $40,000 have just been awarded. Export orders have included two carloads of iron wire. It is estimated that 5,000 electric ranges will be sold in northern and central California this year, approximately an increase of 50 per cent over the sales of 1926.

The majority of sales in the Puget Sound district involved individual motors for replacements although several larger orders are about to be placed. Substation apparatus amounting to $81,000 was purchased by the city of Seattle. Fifteen motors from 50 hp. down were sold to a shingle mill in Bellingham and $3,000 worth of motors was purchased by a pulp mill in Aberdeen. A newly incorporated plywood manufacturing company in Aberdeen will soon send out specifications covering electrical equipment for a large mill. The city of Tacoma has authorized the purchase of $50,000 worth of transformers.

Large Volume of Business in Middle West

The volume of business is quite large in the Middle West, a large portion being placed by utility companies. The purchases of a large central-station company averaged over $140,000 per day. Among the interesting orders placed were one for two 5,000-amp. railway synchronous converters and transformer units, four 800-amp. and twenty-eight 1,600-amp. circuit breakers, two large blowers, economizer repair parts valued at $75,000 and 120,000 ft. of 750,000-circ.mil, 75-kw. paper and lead insulated cable. Appliance sales are normal and the jobber's business is generally good. A considerable volume of business is accruing from wiring devices, and there has been quite a demand for conduit and fittings. A consolidation of most of the fir-producing companies on the Pacific Coast is being looked upon with special interest in this territory.

Sales Active in St. Louis District—Outlook Good

February sales in the St. Louis district are active, and while no notable orders for equipment have been reported, orders for supplies are now being placed by manufacturers in a volume that shows great confidence on their part in the future business. A canvass of the lead belt shows that the production of metal is continuing steadily and in greater tonnage than last winter, owing to the improved machinery installed in the autumn of 1926. When the steam turbines recently purchased are delivered, there will be a call for more motor-driven pumps and other electrical apparatus. Manufacturers of electric fans are booking large orders for later delivery and looking forward to a great fan business. Switchboard builders report an unusually large number of inquiries and orders from the Southwest. Orders for wire, conduit and other construction material are being placed in better volume.

Activities of the Trade

Railway & Industrial Gets Large Switching Equipment Order

The Railway & Industrial Engineering Company, Greensburg, Pa., affiliated with the American Brown Boveri Electric Corporation, has been awarded a contract for all switching equipment and steel work for the 154,000-volt superpower outdoor substation of the Public Service Gas & Electric Company at Marion, N. J. This is the largest outdoor substation in the state of New Jersey. The order calls for delivery during the coming summer.

Annual Electric Truck Show to Be Held in New York

The seventh annual electric truck show will be held this year in the New York Edison Company's showroom at Irving Place and Fifteenth Street during the week of March 14. More than twenty manufacturers of electric trucks and electric truck equipment will be represented in special exhibits, which will include not only the commercial street vehicles, but also various types of appartus used in electric truck garages. The latest developments in semi-automatic and automatic battery charging boards will be on display, along with a feature exhibit of storage batteries, including the smallest and the largest storage battery cells ever manufactured in the United States. The truck show will be open to the public every day from 9 a.m. to 6 p.m. during the entire week.

Allis-Chalmers Reports Sales and Net Profits for 1926

The Allis-Chalmers Manufacturing Company, Inc., Milwaukee, reports sales billed for the fourth quarter of 1926 amounting to $8,188,603. The unfilled orders on hand on Dec. 31, 1926, amounted to $11,634,711, whereas at the close of 1925 they were $10,147,072. The comparative quarterly earnings statement for the years 1926 and 1925 is as follows:

	1926		1925	
	Sales Billed	Net Profit After Taxes	Sales Billed	Net Profit After Taxes
1st Quarter	$ 7,328,018.01	$ 828,401.45	$ 7,130,952.29	$ 847,053.27
2nd Quarter	7,354,067.39	826,157.76	7,042,750.27	830,022.23
3rd Quarter	$ 7,811,853.78	925,661.67	7,298,570.90	826,107.36
4th Quarter	8,188,603.58	1,016,670.69	7,449,083.72	914,185.57
	$30,682,542.76	$3,596,891.57	$28,921,357.18	$3,417,368.43

The 1926 results as above show an increase over 1925 of $179,523.14 or 5.25 per cent, which, after allowing for the preferred dividend of 7 per cent, were equivalent to $9.48 per share on the common stock as compared with $8.78 the year before. Bookings in 1926 aggregated $32,170,181.73, contrasted with $28,944,401.99 in 1925, an increase of $3,225,779.74 or 11.14 per cent.

	Bookings	Billings	Net Profit	Per Cent Eearned for Common
1922	$21,709,016.87	$20,794,045.69	$2,208,549.17	4.09
1923	29,397,295.09	25,612,708.72	2,703,636.39	6.01
1924	25,979,420.19	27,855,523.97	3,221,100.79	8.01
1925	28,944,401.99	28,921,357.18	3,417,368.43	8.78
1926	32,170,181.73	30,682,542.76	3,596,891.57	9.48

Westinghouse Gets Contract for Substation Equipment in Seattle

A contract amounting to $81,202 was entered into by the city of Seattle with the Westinghouse Electric & Mfg. Company for furnishing equipment for the North substation. The apparatus under contract includes two 10,000-kva. transformers, one 165-kv. and two 39-kv. oil circuit breakers, one switchboard, one 187-kv. disconnecting switch, eight 26-kv. current transformers and seven current limiting reactors.

Allis-Chalmers Receives Order for Large Surface Condenser

The Allis-Chalmers Manufacturing Company, Milwaukee, has just received an order for the largest surface condenser equipment ever ordered for one generating unit. The condensers are for the State Line Generating Company for use in connection with a 208,000-kw. triple turbine unit consisting of one high pressure and two low pressure turbines. The two low pressure turbines are each double flow and two condensers are required for each set of low pressure wheels, making four condensers for each low pressure turbine or eight condensers in all.

Each of the eight condensers will contain 22,000 sq.ft. effective cooling surface, or 176,000 sq.ft. in all. The eight condensers will be designed to handle 1,600,000 lb. of steam per hour and supplied with 360,000 gal. per min. of circulating water from four vertical circulating pumps placed in a crib house located outside the generating station. The condensers are of the vertical single pass type; the circulating water entering through the lower water box, passing through the condenser tubes and then being discharged through overflow pipes contained in the condenser shell. The condensate will be collected in hotwells and delivered against 250 lb. gage pressure by six three-stage condensate pumps. The air removal equipment will consist of two stage steam jet air pumps, the first stages being attached to the condenser shell, and the second stages grouped with the surface inter and aftercoolers.

Servel Gets Many Orders for Gas-Fired Refrigerators

Deliveries of "Electrolux" gas refrigerators have been started by the Servel Corporation, 51 East 42nd Street, New York, and these machines are said to be now in satisfactory operation in 38 states, whereas orders have been received by the corporation from every one of the 48 states. The initial shipment of machines has been accomplished. They number in excess of 200 and go to as many individual public utility companies. By reason of the fact that the first shipment was restricted to one machine to a distributor an exceedingly widespread distribution was effected.

The corporation now has its gas refrigerating machine on a production basis and early orders received from a number of the most important gas companies have been so extensive that no more orders for February delivery are being accepted, and orders for delivery now on the company's books extend through the month of June. The company's entire February production of electric refrigerators is also sold. The export sales of the company during 1926 amounted to over $250,000.

Orders Placed for Power House Equipment on Pacific Coast

One of the first large orders to be placed on the Pacific Coast during 1927 was for equipment for the Don Pedro power house of the Turlock and Modesto Irrigation Districts. The total value of the equipment was about $230,000, and delivery is to be made in about six months.

The Allis-Chalmers Manufacturing Company was awarded the contract for two 9,370-kva. vertical water-wheel type generators with exciters costing about $95,000. The Westinghouse Electric & Manufacturing Company received an order for two 9,370-kva. 70,000-volt 3 phase transformers and a 2,500-kva. motor generator set, approximating $80,000. The General Electric Company was awarded the switchboard equipment consisting of a bench panelboard, 73,000-volt oil circuit breakers and disconnecting switches, 6,600-volt oil circuit breakers and a storage battery auxiliary equipment, valued at $55,000.

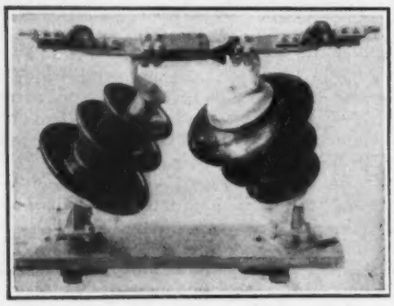
The Sangamo Electric Company, Springfield, Ill., announces the appointment of Reginald Mortimer Campbell as Eastern district manager in charge of watthour and amperehour meter and electric clock sales. Mr. Campbell has been associated with the electrical industry for the past twenty years and for the last two years has been special representative in the New York territory for the Sangamo company handling the sales of watthour meters, particularly to utility companies. He will be assisted by W. S. Boult as sales engineer.

The American Signs Corporation, Kalamazoo, Mich., manufacturer of electrical signs, has work under way for extensions at its local plant to increase the former manufacturing space about 50 per cent.

New Equipment Available

Vertically Mounted Gang-Operated Switches

A new type of vertically mounted gang-operated switches for disconnecting oil breakers, lightning arresters, ets., is announced by the Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago. As shown in the illustration of a single-pole element, both insulators rotate, moving the contacts sidewise, thus securing a maximum



SINGLE-POLE ELEMENT OF VERTICALLY MOUNTED GANG-OPERATED SWITCH

break in a minimum spacing on the supporting structure. The operating handle connecting the interlocking mechanism can be brought down at any desired point.

Soldering Pot

The "Electro-Melter," an electrically operated soldering pot with four-heat control, has been placed on the market by the Electro Engineering Company, Inc., Richmond Hill, N. Y. The four heats are controlled by a special three-pole plug. The male pins mounted within the pot are made of hard-drawn brass and the female clips are of special manganese nickel, which reduces pitting of the contacts and insures perfect connection at all times. The manufacturer claims that this soldering pot was designed to meet the particular needs of central-station and substation construction and repair crews. The type B-30 has a capacity of 30 lb. and the type A-15 pot has a capacity of 15 lb. Both pots are suitable for operation on either alternating or direct current at 110 volts.

Watt-hour Meters

A new line of service type watt-hour meters, known as the type MD, has been developed by the Duncan Electric Manufacturing Company, Lafayette, Ind. This line is being built in sizes from 5 amp. to 25 amp., two- and three-wire, single phase, and supersedes the model M2 in these sizes. The manufacturer states that although the type MD is not radically different from its predecessor in general appearance and design and retains the basic design of the Model M2 in electrical and magnetic features it embodies certain important refinements which give it greatly improved performance characteristics. The full load speed of the type MD is 25 r.p.m. (500 watts), as compared with 36⅔ r.p.m. (550 watts) for the type M2. In addition, this meter has its terminal chamber designed to fit the lately standardized opening in the end wall of service boxes.

Gang-Operated Switch

A standardized line of 66-kv. gang-operated switches known as the "PM Form 2" has been placed on the market by the Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, following a three-year service test. The manufacturer states that the service tests through severe winter conditions show that these switches cannot be frozen in either the open or closed position. This switch is also said to have but few parts, field adjustments can be made readily, and but two insulators per pole are used. The operating handle can be brought down at the center or on either rotating insulator.

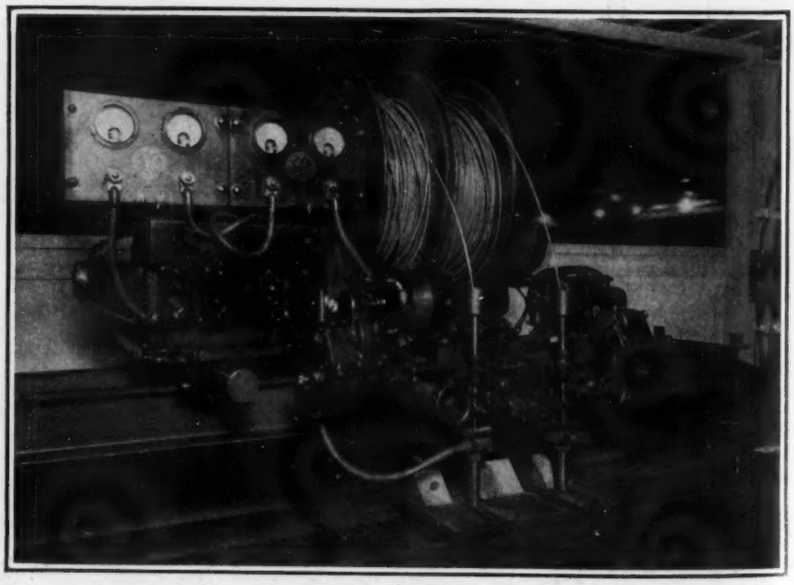
High-Speed Automatic Arc Welder

A new automatic arc welder announced by the General Electric Company is capable of welding heavy plates automatically at approximately ten times the speed which can be obtained with the single-arc manually controlled process. The new machine is known as the "Duo-Arc" automatic welder and consists of a standard travel carriage on which are mounted two automatic welding heads and two reels of electrode wire. The manufacturers claim that this equipment is just as simple to operate as are the single-arc travel carriages. The new welder is said to be of particular value in butt-welding heavy plates.

Heavy-Duty Lighting Equipment.—A separate two-piece hood has been added to the Benjamin "type RR" heavy-duty lighting equipment by the Benjamin Electric Manufacturing Company, Chicago. The manufacturer states that wiring a socket has been made easier with this development as the removal of the body of the hood exposes the terminal base and gives easy access to the wiring terminals. The new hoods are made in both pendent and outlet box types and have the "type RR" screw thread for attaching reflectors, the same as with the former one-piece hoods.

Revolution Stop Counter.—A revolution stop counter for use in automatically stopping a machine after a predetermined number of revolutions, ranging from 1 to 9,750, have been made has been placed on the market by the Viking Tool & Machine Company, 745 Sixty-fifth Street, Brooklyn, N. Y. The device is particularly applicable to various types of coil-winding machines where a fixed number of turns are to be wound, to linear-measuring machines and to machinery where a fixed number of revolutions is desired in performing an operation. Four styles of counters are made. The company states that patent applications on this device are pending.

Porcelain Socket Extension.—To permit the use of the new 100-watt type A lamps in lighting equipment originally planned to take the former 100-watt type C lamps, the Benjamin Electric Manufacturing Company, Chicago, is now making a porcelain socket extension which lengthens the socket and is a part of it rather than a screwed-in addition. This extension, known as No. 4649, fits between the upper and lower parts of the Benjamin two-piece sockets Nos. 86 and 88, without disturbing the wiring, and lowers the filament of the smaller lamp to the right position for correct distribution of light. The manufacturer states that the extension will work equally well with any medium-base lamp, using a reflector with the next smaller-size lamp than the one for which it was intended.



AUTOMATIC ARC WELDER WITH TWO AUTOMATIC WELDING HEADS

New Trade Publications

DOUBLE-THROW SWITCHES. — The Trumbull Electrical Manufacturing Company, Plainville, Conn., has issued a new catalog pages 17 and 17-A, covering its new "type A" line of 600-volt, alternating-current, double-throw safety switches.

ARC-WELDING SETS.—Bulletin GEA-569 issued by the General Electric Company, Schenectady, N. Y., describes the "G-E" constant-potential arc-welding sets designed to generate direct current at 60 volts at all ampere outputs up to their rated capacity. The bulletin contains illustrations showing typical installations and control apparatus.

VALVES.—The Chapman Valve Manufacturing Company, Indian Orchard, Mass., has issued catalog No. 60, covering the Chapman products, including bronze valves, companion flanges, indicator posts, sluicegates, motor-operated valves, hydraulic valves, etc. Illustrations showing typical installations of Chapman motor-valve units and also valves to control hydraulic turbines and sluicegates are included. This book is intended for the use of engineers and contractors as well as the general trade and contains information that is of value to them in the selection of goods they desire to use.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase or agency is desired in Berlin, Germany (No. 23,930), for electrical equipment. Purchase and agency is also desired (No. 23,981) for electromedical apparatus, small electric motors and other electrical novelties.

Purchase and agency are desired in Stuttgart, Germany (No. 23,980), for electrical hair cutters, massage apparatus and hair driers, household and hotel electrical appliances.

Sole agency is desired in London, England (No. 23,912), for electrical hair driers, vibro-massage machines, pocket lamps and batteries. An agency is also desired for electrical household appliances, and electric refrigerators.

An agency is desired in Bogota, Colombia (No. 23,924), for electrical household appliances; also (No. 23,989) for electrical household appliances, especially cooking devices, fans and electric refrigerators.

An agency is desired in Mannheim, Germany (No. 23,956), for electric laboratory equipment.

Purchase and agency are desired in Prague, Czechoslovakia (No. 23,979), for electric refrigerators.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 23, for four motor-generator sets and spares for the local navy yard; also, for two motor-generator sets for the Mare Island yard (Schedule 6709).

BEDFORD, MASS. — Bids will be received by Frank T. Hines, director, until March 1 for construction of buildings and utilities, etc., at the United States Veterans' Hospital, Bedford. Separate bids to be submitted for building construction, plumbing, heating, concrete oil tank, and oil burners, electrical work, electric elevators, ice-making and refrigerating plant and brick chimney.

NORWICH, CONN.—Plans are under consideration by the State Board of Health, Hartford, for building an addition and altering the power plant at the Norwich State Hospital, to cost about $65,000.

Middle Atlantic States

SCHENECTADY, N. Y.—The installation of ornamental lamps on Union Street between Lafayette Street and the city line at Van Antwerp Road, is under consideration by the City Council.

CLIFTON, N. J.—Steps have been taken by the Chamber of Commerce for the installation of ornamental lamps on Dayton and Parker Avenues in the Botany section and on Lakeview and Main Avenues.

BECHTELSVILLE, PA.—The Bechtelsville-Berks Light & Power Company, recently formed, contemplates the erection of transmission lines in this section.

DARBY, PA.—Plans for rebuilding the plant of the Roberts Filter Company, 611 Columbia Avenue, recently damaged by fire, with a loss of about $50,000, include a power plant.

ST. MARYS, PA.—Plans for the proposed addition to the vitrified sewer pipe works of the St. Marys Sewer Pipe Company, to cost about $250,000, include a power house.

HAMPTON, VA.—Plans are being prepared by the Newport News & Hampton Railway, Gas & Electric Company, Newport News, for a new ice plant here, to cost about $300,000.

HOPEWELL, VA.—Plans for the proposed local nitrate plant to be erected by the Allied Chemical & Dye Corporation, 61 Broadway, New York, include a power plant. The entire project will cost about $25,000,000.

RICHMOND, VA.—Plans are under way by the Virginia Electric & Power Company for the erection of a 3,000-hp. substation on Orleans Road, near Thirty-fifth Street, in the Fulton district to cost about $50,000.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until March 1, for insulation material for 3,000,000 ft. of conductor wire; and for heavy outpost twisted pair wire in lots of 500 to 1,700 miles. (Proposal C.P. 25295-A).

North Central States

AKRON, OHIO.—Plans are under way for the construction of a hospital building and nurses home, power house, etc., to be erected on North Main Street, Akron, for J. Schrembs, bishop, Cleveland, at a cost of about $800,000. F. Warner and W. R. McCornack, Bulkley Building, Cleveland, are architects and engineers.

CLEVELAND, OHIO. — Plans for the proposed new factory building to be erected by the Machine Products Company, 17,900 St. Clair Avenue, include a power plant.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Feb. 18 for ornamental "Parkway" lighting standards for the Division of Light and Power. Bids will also be received at the same time and place for paper insulated lead covered cable for the Division of Light and Power.

COLUMBUS, OHIO. — Plans are being considered for the installation of ornamental lamps on Nelson and Falls Roads, Malvern, Sylvia, Willshire, Dartmouth and Ricards Avenues to cost about $36,000.

DELAWARE, OHIO.—The City Council has authorized the installation of an ornamental lighting system on portions of Sandusky and West Winter Street.

TOLEDO, OHIO.—The installation of an ornamental lighting system on Central Avenue is under consideration by the Central Avenue Chamber of Commerce.

EVANSVILLE, IND. — The Southern Indiana Gas & Electric Company, which is erecting a transmission line from Winslow to the Pike County Farm, plans to extend the line on to Maple Beach in the spring.

HAZLETON, IND.—The Town Board is considering the installation of an electric generating unit in the waterworks plant to replace the present steam and gasoline equipment.

CARBONDALE, ILL.—Plans are being prepared by the Ayer & Lord Tie Company for improvements in the power plant at its local works. Douglas & Kryster, 425 East Water Street, Milwaukee, Wis., are engineers.

CHICAGO, ILL.—Permission has been granted the Illinois Power & Light Company, Chicago, to construct a dam and power plant along the Kankakee River in Will and Kankakee Counties.

WAUKEGAN, ILL.—Plans for the proposed local works of the North Shore Coke & Chemical Company, care of the William A. Baehr Organization, 230 South Clark Street, Chicago, engineer, to cost about $2,000,000, include a power plant.

EAGLE RIVER, WIS.—The proposal to expend $53,000 on the municipal electric plant has been approved by the voters. The work will include the installation of a new hydro-electric generating unit.

GREEN BAY, WIS.—The City Council is considering the installation of a new lighting system in the residential district.

KOHLER, WIS.—Bids, it is understood, will soon be asked for extensions in the ornamental street-lighting system, comprising about 200 ornamental standards. The Jerry Donohue Engineering Company, Sheboygan, is engineer.

RICE LAKE, WIS.—The City Council has accepted a new offer of the Northern States Power Company, Eau Claire, in connection with the leasing of the municipal electric plant, subject to the approval of the Railroad Commission and the voters. Under the terms of the agreement the company is to rebuild the city distribution system, at a cost of $27,900, by Sept. 1, and to purchase the electrical equipment which the city now has on hand.

WAUSAU, WIS.—Plans for the proposed transmission line to be erected by the Wisconsin Valley Electric Company from Stevens Point to Buena Vista, have been enlarged to include the town of Plover.

GRAND MARAIS, MINN. — The City Council is considering extending the ornamental lighting system on Fourth Street.

MANKATO, MINN. — The Northern States Power Company, Minneapolis, is planning extensions and improvements in its local plant, including the installation of additional equipment.

MILACA, MINN.—The Eastern Minnesota Power Company, Pine City, is considering extensions and improvements in its local power plant, to cost about $50,000.

THIEF RIVER FALLS, MINN.—Extensions are contemplated to the municipal electric plant to double the present output. The work will include rebuilding the power station, the installation of two new water wheels and other equipment, to cost about $80,000. The Jacobson Engineering Company, N. W. National Life Building, Minneapolis, is engineer.

OXFORD MILLS, IOWA. — The Iowa Electric Company, Cedar Rapids, plans extensions in its local power plant, including the installation of additional equipment, to cost about $100,000.

EAGLE GROVE, IOWA.—An election will be held on Feb. 18 to vote on the proposal to issue $65,000 in bonds for municipal electric light and power plant. Plans are being prepared by H. L. Cory & Company, Aberdeen, S. D.

LANGDON, N. D.—The Otter Tail Power Company, Fergus Falls, Minn., is planning extensions in transmission lines in this section.

WILLISTON, N. D.—The Montana-Dakota Power Company, Fairmont, Mont., is planning to rebuild and raise the voltage of its transmission lines in this vicinity.

CRETE, NEB.—Bids will be received by the City Council until Feb. 19, for equipment for a municipal power plant, including one 400-hp., and one 300-hp. oil engine, direct-connected to 375 kva., and 312 kva. generator, respectively, and complete accessories. The cost is estimated at $75,000. H. A. Davis, Crete, is consulting engineer.

GRAND ISLAND, NEB.—Bids will be received by H. E. Clifford, clerk, about Feb. 15 for extensions to the municipal electric light plant, to cost about $50,000. Contract has been awarded for turbine and condensers. The Pillsbury Engineering Company, 2,344 Nicollett Avenue, Minneapolis, is engineer.

BLAIR, KAN.—Local business men have organized a company to supply electricity in Blair. It is proposed to erect a transmission line to Wathena, where it will connect with the lines of the St. Joseph (Mo.) Railway, Light, Heat & Power Company.

NESS CITY, KAN.—The municipal electric light and power plant has been acquired by the Western Light & Power Company, Salina.

Southern States

HENDERSONVILLE, N. C.—The Griffing Pinnacle Estates, Flatiron Building, Asheville, contemplates the construction of a hydro-electric plant in connection with a land development in this vicinity. The cost of the entire project is estimated at $1,000,000. James F. Lewis, 312 Flatiron Building, is engineer.

TIFTON, GA.—The South Georgia Power Company, Albany, plans to build a transmission line from Tifton to Ocilla.

HENRY, TENN.—The City Council is considering the installation of a municipal electric light and power plant, to cost about $15,000.

ISOLA, MISS.—The Mississipi Power & Light Company, plans to build a substation here, to cost about $15,000.

PASAGOULA, MISS. — The Mississippi Power Company, Gulfport, which has acquired the municipal electric plant, plans to rebuild the distribution lines here and in Moss Point.

JACKSON, LA.—Bids, it is understood, will soon be asked by D. Stewart, Natchez, Miss., for construction of waterworks, also for electric power plant and distribution system in Jackson and several towns. The equipment will include a 200-kva. generating unit. The cost of the project is estimated at $200,000.

CHEYENNE, OKLA.—Surveys are being made by the Southwestern Light & Power Company, Braniff Building, Oklahoma City, for the erection of a transmission line, 35 miles long, from Leady to Cheyenne, and an electric distribution system here, to cost about $45,000. E. R. Ernsberger, Braniff Building, Oklahoma City, is engineer.

FORT WORTH, TEX.—Plans are under consideration for the installation of an ornamental lighting system on Main and Houston Streets, to cost about $75,000. C. A. Winder is supervisor of public utilities.

SHERMAN, TEX.—The Texas Power & Light Company, Dallas, is planning to build an addition to its local substation, to cost about $45,000.

VENUS, TEXAS.—The Texas Power & Light Company, Dallas, which has acquired the municipal power plant, plans extensions in its transmission lines in this section.

Pacific and Mountain States

LONGVIEW, WASH. — The Long-Bell Lumber Company plans to build an addition to its power plant, to include the installation of a 6,000-kw. generator, etc. L. D. Beech is power engineer for the company.

PROSSER, WASH.—The Pacific Power & Light Company, Portland, plans to rebuild its transmission line between Prosser and Sunnyside, to cost about $60,000.

SEATTLE, WASH.—The installation of cluster lamps on the Phinney Avenue-Greenwood Avenue Highway, from Woodland Park to the city limits, is under consideration by the City Council. The cost is estimated at $96,490.

YAKIMA, WASH.—The Pacific Power & Light Company, Portland, plans to rebuild its transmission and distributing lines in this vicinity, with a number of extensions.

ASTORIA, ORE.—The Pacific Power & Light Company, Portland, plans extensions and improvements in its local substation.

SALEM, ORE. — The Mountain States Power Company, Albany, has secured permission to erect an 11,000-volt transmission line covering about 35 miles of roads.

LONG BEACH, CAL.—The City Council has authorized the installation of ornamental lamps on Pacific Avenue, using metal standards.

LONG BEACH, CAL. — The Southern California Edison Company has applied to the War Department for permission to construct a steel-tower transmission line across Cerritos Channel, Long Beach Harbor, to carry four groups of high tension lines, the towers to be not less than 200 ft. above mean low water.

LOS ANGELES, CAL.—The Board of Public Works has recommended to the City Council the installation of ornamental lamps on Orange Grove Avenue.

LOS ANGELES, CAL.—The City Council has authorized the installation of ornamental lamps on Mesmer and Fowler Avenues, and on portions of Pershing and Esplanade Drives.

POMONA, CAL.—Informal bids are being asked by the City Council, until March 1, for the installation of an ornamental lighting system on Holt Avenue, requiring 138 standards. F. C. Froehde is city engineer.

SAN FRANCISCO, CAL. — The Yuba River Power Company, 225 Bush Street, has applied for permission to use additional water from the middle fork of the Yuba River, in connection with its proposed hydro-electric power project to develop about 46,100 hp., to cost with steel tower transmission lines, is estimated at $30,000,000.

TORRANCE, CAL.—Plans for the proposed local refinery to be built by the General Petroleum Corporation, Higgins Building, to cost about $5,000,000, include a power plant.

VENTURA, CAL. — The installation of ornamental lamps on approximately 8 miles of streets is under consideration.

TOOELE, UTAH—The City Council is considering the installation of an ornamental lighting system in the business district. J. D. Gollaher is engineer.

SACO, MONT.—The City Council is considering the installation of an improved lighting system, to cost about $10,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued Jan. 11, 1927)

1,614,292. INDUCTION MOTOR FOR GRINDING MACHINES AND THE LIKE; A. W. Forbes, Worcester, Mass. App. filed Nov. 19, 1923. Having the core cut away on one side so that the wheel on the motor shaft can project beyond the periphery of the core. This involves the unbalancing of the windings, and the invention provides means whereby the same can be rebalanced so as to produce a uniformly rotating field.

1,614,306. ELECTRICAL CONNECTOR WITH AUTOMATIC CIRCUIT BREAKER; T. Klotzli, Thoune, Switzerland. App. filed March 29, 1923. Of the kind comprising a wheel rigidly connected by a congealed fusible mass with a fixed part that is thermally connected with a circuit-closing member and serves to hold the spring-controlled circuit-closing contact piece in its closed position by means of a pawl.

1,614,308. ELECTRIC RADIATOR; J. F. Lamb, New Britain, Conn. App. filed June 6, 1919. Bowl type.

1,614,321. ELECTRIC FURNACE; E. L. Smalley, South Orange, N. J. App. filed June 1, 1922. In which the inner surface of the wall is extended to provide a surface of increased heat-radiating area for directing the heat rays toward the interior space of the furnace. A furnace in which the heating elements are removably mounted on the wall thereof in exposed relations to the interior space of the furnace.

1,614,330, 1,614,331. ELECTRICAL HEATING ELEMENT; E. L. Wiegand, Dormont Borough, Pa. Apps. filed Aug. 31, 1923, and Dec. 24, 1924. Of the type wherein the resistor is enveloped in refractory material.

1,614,377. ELECTRIC LIGHTING TIME CLOCK; H. Margiloff, Brooklyn, N. Y. App. filed Dec. 18, 1925.

1,614,382. BATTERY TERMINAL FOR UPRIGHT POSTS; E. E. Ness, Wetaskiwin, Alberta, Canada. App. filed April 14, 1923.

1,614,415. AUTOMATIC REGULATION OF ARC LAMPS; K. Vesely and K. Lustig, Prague, Czechoslovakia. App. filed March 27, 1926. For automatically maintaining the light source, which is located in the crater formed in the end of the positive electrode of the lamp in a predetermined position with respect to the co-operating parts of the lamp.

1,614,434. ELECTRIC HEATING DEVICE; J. H. Reichart, Muncie, Ind. App. filed July 31, 1924. Whereby the coils are more closely concentrated and whereby plural coils or circuits are arranged in a minimum superficial area.

(Issued Jan. 18, 1927)

1,614,506. ELECTRICAL DEVICE; C. C. Van Voorhis, East Orange, N. J. App. filed Feb. 16, 1922. Discharge gas or glow lamp. A lamp with a stabilizing resistance element which may constitute an integral part of the lamp.

1,614,508. ELECTRIC SOCKET; A. C. Saxe, Winsted, Conn. App. filed April 18, 1924. Plug socket as used with appliances.

1,614,533. AUTOMATIC FUSE CUT-OUT; J. W. Nolan, Pawtucket, R. I. App. filed Nov. 12, 1917. Fuse cut-out used in connection with three-phase electrical circuits, or four-wire, two-phase circuits, etc. Having a mechanically operated means whereby when a fuse in any one of the circuits is blown the switch in another circuit will be automatically opened so that all of the power circuits are open.

1,614,542. COVER FOR SWITCH BOXES; R. Werden, Trinidad, Col. App. filed March 1, 1926.

1,614,562. APPARATUS AND METHOD OF WIRE DRAWING AND ALLOY WIRES USED FOR RADIO TUBES AND OTHER PURPOSES; C. A. Laise, Haworth, N. J. App. filed Sept. 5, 1925.

1,614,616. BRUSH HOLDER; J. T. Janette, Chicago, Ill. App. filed July 30, 1923. Adaptable for use in connection with repulsion-induction motors.

1,614,620. ELECTRIC WATER HEATER; E. E. Kittredge, J. A. Forster, and R. D. Johansen, Alameda, Cal. App. filed May 6, 1925. Induction type.

1,614,621. MERCURY-TUBE SWITCH; I. E. McCabe, Chicago, Ill. App. filed July 9, 1923. The operation of which is adjustably controlled by temperature and electricity combined.

1,614,646. ELECTRIC FUSE AND FUSE HOLDER; A. J. Bowie, San Francisco, Cal. App. filed May 19, 1921. Primarily designed for high voltage.

1,614,675. ELEVATOR SAFETY APPLIANCE; T. L. Jones, Newark, N. J. App. filed Oct. 3, 1923.

1,614,692. JUMP SPARK IGNITER FOR OIL BURNERS, ETC.; O. C. Schroeder, Chicago, Ill. App. filed March 11, 1925.

1,614,723. MEANS FOR CONTROLLING THE TEMPERATURE IN FURNACES AND OTHER APPARATUS; N. H. Freeman, Holborn, London, England. App. filed Feb. 3, 1921.

1,614,727. COMBINED INCUBATOR AND HOVER; L. E. Goble, Columbia City, Ind. App. filed April 9, 1923.

1,614,880. CONNECTION FOR STORAGE-BATTERY TERMINALS; A. C. Collins, Rogers, Ark. App. filed June 5, 1924.

1,614,889. HIGH-TENSION CONSTRUCTION WORK; C. G. Koppitz, Greensburg, Pa. App. filed Jan. 13, 1926. The mounting of insulators upon their supports.

1,614,916. TREATMENT OF WOOD SEPARATORS; C. C. Carpenter, Niagara Falls, N. Y. App. filed June 21, 1923.

1,614,920. ELECTRICAL RESISTANCE GRID; C. T. Evans, Titusville, Pa. App. filed Aug. 14, 1922. A cast grid which shall not have more expansion and contraction than would cast iron while having the strength and durability which are characteristic of steel. A ferrous alloy electrical resistance which is cast in grids. A cast electrical resistance grid comprising the following ingredients in substantially the following percentages: Chromium, 3.50 to 7.75; nickel, 10 to 20; carbon, 0.20 to 1.00; manganese, 0.25 to 2.50; silicon, 0.15 to 2.50—the remainder being principally iron.

1,614,938. ELECTRICAL HEATING ELEMENT OF THE STRIP TYPE; E. L. Wiegand, Dormont Borough, Pa. App. filed Aug. 31, 1923.

1,614,974. ELECTRIC WATER HEATER; N. F. Strauss, Milwaukee, Wis. App. filed Feb. 15, 1926. Of the circulating type through which the water passes both inside and outside of the heater in a continuous flowing stream, thus exposing the maximum surface for heating the water and adapting the heater to continuous heating of the stream of flowing water.

1,614,975. PLUG; L. C. Tate, Newburgh, Ind. App. filed Jan. 14, 1925. Wherein use is made of a fuse holder designed to support a plurality of fuses adapted to be singly and automatically arranged in a position for use when a particular fuse is blown or impaired.

1,615,018. AUTOMATIC ELECTRIC CURRENT REGULATOR; W. Langdon-Davis and A. Soames, London, England. App. filed May 28, 1923. For use as choke coils in alternating-current arc welding. A regulator which will automatically give the circuit a slowly falling volt-ampere characteristic when the arc is being struck and a more rapidly falling characteristic when the arc has been formed.

1,615,019. MOTOR CONTROLLER; A. J. Liebenberg, Cincinnati, Ohio. App. filed Dec. 7, 1923. Primarily for elevator service. The controller generally is employed in connection with a reconnected two-speed alternating-current motor, although the controller is adaptable for other types of motors.